

REPORTABLE INFECTIOUS DISEASE IN KANSAS

2014 SUMMARY



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INTRODUCTION

PURPOSE AND FORMAT OF THIS REPORT

This is the nineteenth annual summary of reportable diseases published by the Kansas Department of Health and Environment (KDHE). The purpose of this report is to provide useful information for health care providers, public health colleagues, and policy makers about infectious diseases in Kansas. The focus of the report is the assessment of disease trends, including incidence, severity, populations affected, and risk factors for infection.

The following reportable diseases are not included in this summary: Acquired Immune Deficiency Syndrome (AIDS), chancroid, chlamydia, gonorrhea, Human Immunodeficiency Virus (HIV), tuberculosis, and syphilis. Statistical information for these diseases can be found at KDHE's Bureau of Disease Control and Prevention website at <http://www.kdheks.gov/bdcp/index.html>.

Some reportable diseases were not detected during 2014; information is presented for those diseases that were reported. Cases must meet the surveillance definition for a confirmed or probable case and have been reported to KDHE before May 1, 2015 to be included in this document.

Incidence rates have been calculated from the vintage 2014 population estimates provided by the U.S. Census Bureau. Whenever possible, information about disease trends for the United States has been included for comparison with Kansas' trends. Due to confidentiality concerns, limited demographic information is presented if fewer than five total cases of a disease were reported.

Race data is collected for most diseases using the following categories: American Indian/Alaska Native, Asian/Pacific Islander, Black/African-American, and White. If an individual reports more than one race category, the race is classified as "Other". Currently, incidence calculations are not performed for the other race category. Ethnicity data is reported as either Hispanic or non-Hispanic. Disease incidence of urban and non-urban counties has been included. Urban counties are defined as having a population density of greater than 150 people per square mile. Kansas' six urban counties account for more than half of the state population: Johnson, Wyandotte, Sedgwick, Shawnee, Douglas, and Leavenworth. The remaining 99 counties in the state are aggregated into the "non-urban" category.

The report is divided into three sections. Section I presents summaries of infectious, reportable diseases or conditions of public health importance. Each of the disease summaries includes a brief overview of the disease and selected analysis of the disease in Kansas. Section II includes special studies and reports. Section III includes reference documents and supplementary tables.

DISEASE REPORTING IN KANSAS

Health care providers, laboratories, and hospitals are required by Kansas law (K.S.A. 65-118, 65-128; 65-6001 through 65-6007; K.A.R. 28-1-2, 28-1-4, and 28-1-18) to report selected diseases and conditions. Reports of infectious diseases are initially sent to KDHE's Bureau of Epidemiology and Public Health Informatics, where they are reviewed and forwarded to local health departments. The local health departments are responsible for any required investigation and for instituting basic public health interventions.

Case reports are stored in Kansas' electronic disease surveillance system (also known as EpiTrax). EpiTrax is a central, statewide database of reportable and selected non-reportable diseases and conditions. It can be accessed via the internet by authorized public health officials. To protect restricted, confidential, health and clinical data of individuals, internal security structures are in place. EpiTrax allows users to report disease occurrences rapidly and efficiently; user may also generate summary statistics and reports to assist in evaluating public health efforts. Kansas' disease incidence numbers are transmitted from EpiTrax to the Centers for Disease Control and Prevention (CDC) every week for inclusion in *Morbidity and Mortality Weekly Report (MMWR)*, a series of publications produced by the CDC's Epidemiology Program Office.

In collaboration with the Council of State and Territorial Epidemiologists (CSTE), CDC publishes case definitions for public health surveillance - the CDC/CSTE surveillance case definitions combine clinical, laboratory, and epidemiologic criteria. By providing uniform criteria for disease reporting, case definitions allow greater specificity and comparability of diseases reported from different geographic regions. The CDC/CSTE case definitions can be found at <https://wwwn.cdc.gov/nndss/conditions/notifiable/2014/infectious-diseases/>.

The usefulness of public health surveillance data depends on its uniformity, simplicity, and timeliness. The case definitions in this report follow the CDC/CSTE surveillance definitions for disease reporting and should not be confused with clinical diagnoses. The use of additional clinical, epidemiologic, and laboratory data may enable a physician to diagnose a disease even though the formal standardized surveillance case definition may not be met.

INTERPRETATION OF THE DATA

When interpreting the data in this report, it is important to remember that the completeness of disease reporting is variable. For example, nationwide reporting of salmonellosis is estimated to be 2% complete; the actual number of persons infected with the disease is likely much higher than the number who sought medical care and were in turn reported to public health. When interpreting data, absolute numbers are less meaningful than trends; however, trends can be influenced by changes in case definitions, reporting patterns, and by random fluctuations. It is also important to note that small numbers affect rates and interpretation of rates. Small case numbers can produce artificially high disease rates and unstable, widely fluctuating disease trends.

In addition, prior to 2012, only cases classified as "confirmed" were included in disease counts and rates for *Reportable Infectious Diseases in Kansas*. Beginning in 2012, in accordance with how case counts are transmitted to CDC for publication in the MMWR, both confirmed and probable case counts are included for many diseases presented in the summary. Because of this change, case counts and rates for 2012 and all following years may be higher compared with previous years' data. The case report counts that now include confirmed and probable cases are anthrax; arboviral disease; brucellosis; campylobacteriosis; cryptosporidiosis; cyclosporiasis; dengue hemorrhagic fever; diphtheria; ehrlichiosis/ anaplasmosis; giardiasis; *Haemophilus influenzae*, invasive disease (including Hib); hemolytic-uremic syndrome, post-diarrheal (HUS); Lyme disease; meningococcal disease; mumps; pertussis; plague; psittacosis; Q fever, acute and chronic; salmonellosis; severe acute respiratory syndrome (SARS); Shiga toxin-producing *Escherichia coli* (STEC); shigellosis; spotted fever rickettsiosis; tetanus; toxic-shock syndrome (staphylococcal and streptococcal); tularemia; typhoid fever; varicella; and yellow fever.

2014 NOTABLE DISEASE EVENTS

Shiga Toxin-Producing *E. coli*: Four confirmed primary cases of STEC O157 were associated with attendance at a house party held on May 5, 2014 in south central Kansas. Three children were hospitalized, and two developed hemolytic uremic syndrome (HUS). Reported activities at the event included playing in a small “kiddie” pool that was purchased and filled the day of the event. Attendees reported that there was calf manure in the yard where the children were playing, outside of the pen where the calf was held for the duration of the party. The four primary cases all reported playing in the “kiddie” pool and getting splashed in the face and mouth.

Clostridium perfringens: An outbreak of gastrointestinal illness occurred in a Topeka correctional facility, resulting in 176 individuals (159 residents and 8 staff) meeting case definition. Four stool specimens were tested by CDC with *C. perfringens* isolated from all four specimens. Three of the four specimens were also positive for *C. perfringens* enterotoxin. An environmental assessment of the facility revealed both inadequate hot holding and cold holding temperatures.

Pertussis: An outbreak of 137 cases of pertussis were identified among schools and a church in a highly unvaccinated community in Pottawatomie County. This outbreak was detected by routine surveillance after case review by KDHE identified an increase in pertussis cases that all attended the same school. This outbreak lasted an entire year and affected persons ranging in age from 3 months to 67 years. No hospitalizations or deaths were reported. Of the 127 persons with documented vaccinations histories, 47 (37.0%) pertussis cases had received at least one-pertussis containing vaccine and 80 (63.0%) ill persons were completely unvaccinated.

Campylobacteriosis: Six cases of campylobacteriosis were identified among workers at the Kansas State University Dairy Unit. *C. jejuni* was detected in 3 of the 6 cases, and 2 of the *C. jejuni* isolates were indistinguishable by PFGE, suggesting those cases were exposed to the same source, possibly one infected cow. The investigation had several limitations, including a low survey response rate (40%). Also, the case definition relied on self-reported diarrhea and may include individuals who were ill from causes other than *Campylobacter*.

Measles: From May through July of 2014, 14 individuals were diagnosed with measles in Kansas. Of the 14 cases, three were Johnson County residents, and ten were Sedgwick County residents, and one was a Nebraska resident who contracted measles in Sedgwick County. SCHD administered IG to 11 individuals and vaccinated over 400 persons with the MMR vaccine. Public health interventions during this outbreak were instrumental in preventing additional individuals from becoming ill.

Enterovirus D68: An outbreak of 11 cases of enterovirus D68 was identified among Morton County, Kansas students who attended two elementary schools near the Kansas/Oklahoma border. Six nasopharyngeal swabs were collected and tested with five of the six being positive for EV-D68. Seven hospitalizations resulted from illness. In summer and fall 2014, the United States experienced a nationwide outbreak of EV-D68 associated with severe respiratory illness; CDC reported a total of 1,153 people in 49 states and the District of Columbia with respiratory illness caused by EV-D68. Almost all of the confirmed cases were among children, many whom had asthma or a history of wheezing. Additionally, there were likely many thousands of mild EV-D68 infections for which people did not seek medical treatment and/or get tested.

2014 INFECTIOUS DISEASE OUTBREAKS

[NOTE: Written reports of some outbreak investigations can be found at <http://www.kdheks.gov/epi/outbreaks.htm>]

In 2014, the Kansas Department of Health and Environment's (KDHE) Infectious Disease Epidemiology and Response team investigated 43 suspected outbreaks of infectious disease. Thirty-nine confirmed outbreaks were identified; 676 ill persons were associated with these outbreaks. The median annual number of confirmed outbreaks from 2012-2014 was 52 (range, 39 to 55).

The 39 outbreaks were categorized as follows: 11 vaccine-preventable disease (VPD) outbreaks, 9 norovirus outbreaks (6 person-to-person and 3 foodborne), 8 enteric (not norovirus, foodborne, or waterborne) outbreaks, 7 respiratory (including influenza) outbreaks, 3 confirmed foodborne (not norovirus) outbreaks, and 1 outbreak of a non-reportable condition. Twenty of the 39 confirmed outbreaks caused gastrointestinal illness (51.3%).

Norovirus and vaccine-preventable outbreaks in 2014 resulted in the most reported cases, with 231 and 230 total cases respectively. Among enteric outbreaks in 2014, excluding norovirus, foodborne, waterborne outbreaks, shiga-toxin producing *Escherichia coli* (STEC) was the most common causative agent with three outbreaks and 20 total cases. Among VPD outbreaks, pertussis was the most common causative agent with seven outbreaks and 207 total cases.

Number of Total Cases by Outbreak Classification, Kansas, 2014

Outbreak Classification	Number of Total Cases	% of Total Cases
Norovirus	231	34.2%
Vaccine-preventable	230	34.0%
Respiratory, including influenza	113	16.7%
Enteric (not norovirus, foodborne, or waterborne)	59	8.7%
Foodborne	38	5.6%
Non-reportable condition	5	0.7%

Causative Agents for Enteric* Outbreaks, Kansas, 2014

Causative Agent	Number of Confirmed Outbreaks	Number of Total Cases
Shiga-toxin producing <i>Escherichia coli</i> (STEC)	3	20
Salmonellosis	2	8
Campylobacteriosis	1	6
Shigellosis	1	10
Unknown	1	15

* Enteric outbreaks do not include norovirus, foodborne, or waterborne outbreaks

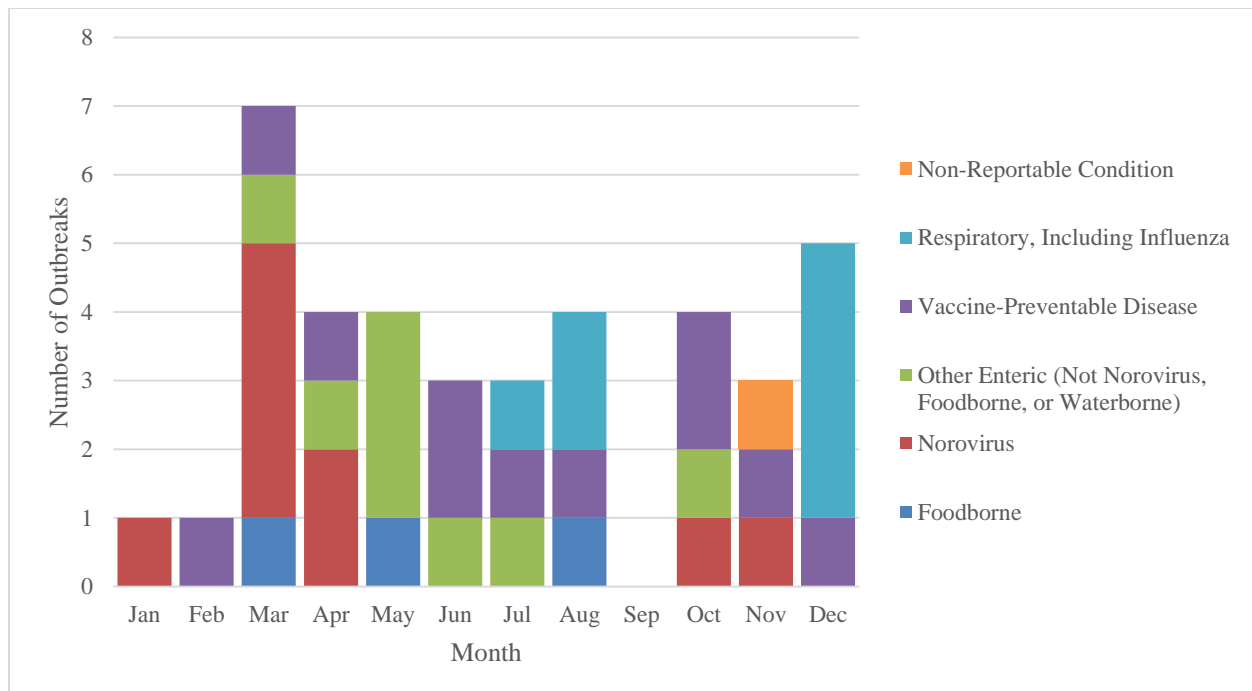
Causative Agents for Vaccine-Preventable Disease Outbreaks, Kansas, 2014

Causative Agent	Number of Confirmed Outbreaks	Number of Total Cases
Pertussis	7	207
Measles (Rubeola)	2	14
Varicella (Chickenpox)	2	9

The two main modes of transmission seen in outbreaks of norovirus are person-to-person and foodborne transmission. In the 2014 year, six of the nine norovirus outbreaks were attributed to person-to-person spread of illness. In situations where person-to-person transmission is being reported, KDHE provides guidance for cleanup of potentially contaminated materials, emphasizing good handwashing practices, and direction for disinfecting contaminated surfaces. Further guidance on isolation and quarantine are provided to limit the spread of illness. Foodborne outbreaks of norovirus are most often due to ill food workers handling ready-to-eat food items in restaurant settings. Ill or convalescent individuals may also contaminate shared food, such as self-serve food items at a gathering or event. Prevention of further disease transmission during norovirus outbreaks is accomplished by emphasizing good handwashing practices, minimizing bare hand contact with ready-to-eat food items, minimalizing environmental contamination, and not preparing food until 48 hours after norovirus symptoms stop.

Certain types of outbreaks are more common during specific times of the calendar year. The graph seen below depicts the outbreaks seen in 2014 by the month in which they were reported and the category in which the causative agent is found.

Confirmed Outbreaks by Category and Month, Kansas, 2014



SECTION I: DISEASE SUMMARIES

AMEBIASIS

CLINICAL FEATURES: There are two forms of amebiasis: intestinal and extraintestinal. The intestinal form of the disease is usually asymptomatic, ranging from acute mild abdominal discomfort to chronic diarrhea and fulminating dysentery. Fever, chills, and bloody mucoid diarrhea may also be present. Diarrheal episodes may alternate with periods of constipation or remission. The extraintestinal form appears in severe cases, often characterized by amebic liver abscesses. Infection also may be asymptomatic.

CAUSATIVE AGENT: The protozoan parasite *Entamoeba histolytica*.

MODE OF TRANSMISSION: *E. histolytica* predominantly infects humans and other primates. Transmission among humans most often occurs through ingestion of chlorine-resistant amebic cysts present in fecally contaminated water or food. Oral-anal sexual contact is also a risk factor for infection.

INCUBATION PERIOD: Onset of symptoms usually occurs 2 to 4 weeks after infection, but this may be variable.

PERIOD OF COMMUNICABILITY: Infection may occur as long as cysts are present in stool, which may continue for years.

PUBLIC HEALTH SIGNIFICANCE: Amebiasis is of public health concern due to the prolonged shedding period and the severe complications that may develop, usually involving the liver. Immunocompromised persons are also at increased risk of developing the severe form of disease. Treatment is available for both intestinal and extraintestinal amebiasis.

REPORTABLE DISEASE IN KANSAS SINCE: 1982.

CLINICAL CRITERIA FOR SURVEILLANCE PURPOSES

- Infection of the large intestine by *Entamoeba histolytica* may result in an illness of variable severity ranging from mild, chronic diarrhea to fulminant dysentery. Extraintestinal infection also can occur (e.g., hepatic abscess).

LABORATORY CRITERIA FOR SURVEILLANCE PURPOSES

- Intestinal amebiasis
 - Demonstration of cysts or trophozoites of *E. histolytica* in stool or
 - Demonstration of trophozoites in tissue biopsy or ulcer scrapings by culture or histopathology
- Extraintestinal amebiasis
 - Demonstration of *E. histolytica* trophozoites in extraintestinal tissue

SURVEILLANCE CASE DEFINITIONS

- *Confirmed, intestinal amebiasis*: a clinically compatible illness that is laboratory confirmed. Asymptomatic intestinal carriage of *E. histolytica* should not be reported.
- *Confirmed, extraintestinal amebiasis*: a parasitologically confirmed infection of extraintestinal tissue, or among symptomatic persons (with clinical or radiographic findings consistent with extraintestinal infection), demonstration of specific antibody against *E. histolytica* as measured by indirect hemagglutination or other reliable immunodiagnostic test (e.g., enzyme-linked immunosorbent assay). Among asymptomatic persons, a positive serologic test does not necessarily indicate extraintestinal amebiasis.

EPIDEMIOLOGY AND TRENDS

Three confirmed cases of intestinal amebiasis were reported during 2014. The three-year median for 2011-2013 was four cases. Infections are not tracked nationally – no comparable U.S. rate is available.

Confirmed Cases: 3

Kansas incidence per 100,000 population (2014): 0.1
U.S. incidence per 100,000 population (2013): N/A

ARBOVIRAL DISEASE

(Includes West Nile, Western equine, California serogroup, Eastern equine, Powassan, St. Louis arboviruses, and Chikungunya)

CLINICAL FEATURES: Arboviral infections may be asymptomatic or may result in illness of variable severity, sometimes associated with central nervous system (CNS) involvement. When the CNS is affected, clinical syndromes ranging from febrile headache to aseptic meningitis to encephalitis may occur. West Nile virus (WNV) presents clinical features similar to other causative agents of meningitis and encephalitis.

CAUSATIVE AGENT: Arboviruses, including West Nile, Western equine, Eastern equine, Powassan, St. Louis arboviruses, and Chikungunya.

MODE OF TRANSMISSION: Arboviruses are transmitted by the bite of an infected mosquito. Natural transmission involves a mosquito-bird-mosquito cycle; animals such as humans and horses do not circulate enough virus to re-infect a blood-feeding mosquito, and thus are referred to as “dead-end” or “accidental” hosts. Mosquito species responsible for transmission vary by region. Chikungunya virus occurs after mosquitoes become infected when they feed on a person already infected with the virus. Infected mosquitoes can then spread the virus to other people through bites.

INCUBATION PERIOD: The incubation period for arboviral diseases varies. For West Nile virus, the incubation period ranges from 3 to 15 days (usually 6 days). For Chikungunya, the incubation period ranges from 3 to 7 days.

PERIOD OF COMMUNICABILITY: Human-to-human transmission is exceptionally rare, but has occurred among blood and organ recipients.

PUBLIC HEALTH SIGNIFICANCE: The role of public health is limited to surveillance and education. Prevention is accomplished through adopting personal behaviors to prevent being bitten by mosquitoes, and through destroying mosquito breeding sites.

REPORTABLE DISEASE IN KANSAS SINCE: 2002

CLINICAL CRITERIA FOR SURVEILLANCE PURPOSES

Neuroinvasive disease

- Fever ($\geq 100.4^{\circ}\text{F}$ or 38°C) as reported by the patient or a health-care provider, **AND**
- Meningitis, encephalitis, acute flaccid paralysis, or other acute signs of central or peripheral neurologic dysfunction, as documented by a physician, **AND**
- Absence of a more likely clinical explanation.

Non-neuroinvasive disease

- Fever ($\geq 100.4^{\circ}\text{F}$ or 38°C) as reported by the patient or a health-care provider, **AND**
- Absence of neuroinvasive disease, **AND**
- Absence of a more likely clinical explanation.

LABORATORY CRITERIA FOR SURVEILLANCE PURPOSES

- Isolation of virus from, or demonstration of specific viral antigen or nucleic acid in, tissue, blood, CSF, or other body fluid, **OR**
- Four-fold or greater change in virus-specific quantitative antibody titers in paired sera, **OR**
- Virus-specific IgM antibodies in serum with confirmatory virus-specific neutralizing antibodies in the same or a later specimen, **OR**
- Virus-specific IgM antibodies in CSF and a negative result for other IgM antibodies in CSF for arboviruses endemic to the region where exposure occurred, **OR**
- Virus-specific IgM antibodies in CSF or serum.

SURVEILLANCE CASE DEFINITIONS

- *Confirmed:*

Neuroinvasive disease

A case that meets the above clinical criteria for neuroinvasive disease and one or more the following laboratory criteria for a confirmed case:

- Isolation of virus from, or demonstration of specific viral antigen or nucleic acid in, tissue, blood, CSF, or other body fluid, **OR**
- Four-fold or greater change in virus-specific quantitative antibody titers in paired sera, **OR**
- Virus-specific IgM antibodies in serum with confirmatory virus-specific neutralizing antibodies in the same or a later specimen, **OR**
- Virus-specific IgM antibodies in CSF and a negative result for other IgM antibodies in CSF for arboviruses endemic to the region where exposure occurred.

Non-neuroinvasive disease

A case that meets the above clinical criteria for non-neuroinvasive disease and one or more of the following laboratory criteria for a confirmed case:

- Isolation of virus from, or demonstration of specific viral antigen or nucleic acid in, tissue, blood, CSF, or other body fluid, **OR**
- Four-fold or greater change in virus-specific quantitative antibody titers in paired sera, **OR**
- Virus-specific IgM antibodies in serum with confirmatory virus-specific neutralizing antibodies in the same or a later specimen, **OR**

- Virus-specific IgM antibodies in CSF and a negative result for other IgM antibodies in CSF for arboviruses endemic to the region where exposure occurred.

➤ *Probable:*

Neuroinvasive disease

A case that meets the above clinical criteria for neuroinvasive disease and the following laboratory criteria:

- Virus-specific IgM antibodies in CSF or serum but with no other testing.

Non-neuroinvasive disease

A case that meets the above clinical criteria for non-neuroinvasive disease and the laboratory criteria for a probable case:

- Virus-specific IgM antibodies in CSF or serum but with no other testing.

EPIDEMIOLOGY AND TRENDS

WEST NILE VIRUS

In 2014, there were 18 probable cases of neuroinvasive West Nile virus (WNV) and 2 confirmed and 34 probable cases of non-neuroinvasive WNV. The median age was 54 years (range 10 – 78 years). Twenty-seven cases (50%) were hospitalized. There were no deaths.

The earliest cases were reported in August. The majority (74%, n=40) of cases occurred in September, followed by August (n=11), and October (n=3). This was the highest number of cases reported in Kansas since 2003.

Confirmed and Probable Cases: 54

Kansas incidence per 100,000 population (2014): 1.86

U.S. incidence per 100,000 population (2013): 0.78

WEST NILE VIRUS MOSQUITO SURVEILLANCE

During 2014, the Kansas Biological Survey partnered with the Sedgwick County Health Department and the Kansas Department of Health and Environment to conduct mosquito surveillance in Sedgwick County. Mosquito surveillance was conducted from May through September and potential vector mosquitoes were tested for West Nile virus at the Kansas Health and Environmental Laboratories. Mosquitoes were pooled for testing with up to 50 mosquitoes included per vial. A total of 143 mosquito pools were tested for West Nile virus: one (0.7%)

tested positive. The WNV-positive pool was collected on August 19th. No cases of St. Louis or La Crosse encephalitis virus were reported in humans or found in mosquitoes during 2014.

CHIKUNGUNYA VIRUS

In 2014, there were 7 probable cases and 7 confirmed cases of Chikungunya. The median age was 54 years (range 10 – 78 years). Twenty-seven cases (50%) were hospitalized. There were no deaths. All cases were travel-associated.

Confirmed and Probable Cases: 14

Kansas incidence per 100,000 population (2014): 0.48

U.S. incidence per 100,000 population (2013): *N/A*

BRUCELLOSIS

CLINICAL FEATURES: Acute or insidious onset of intermittent or irregular fever, chills, profuse night sweats, weakness, profound fatigue, depression, weight loss, arthralgia and generalized aching. Localized suppurative infections of organs, including liver and spleen, as well as chronic localized infections may occur. Subclinical disease has been reported. Symptoms may last for weeks, months, or years if not adequately treated.

CAUSATIVE AGENT: *Brucella* spp., small gram-negative coccobacilli. Generally caused by *B. abortus*, *B. melitensis*, *B. suis*, and rarely *B. canis*.

MODE OF TRANSMISSION: Several animals are reservoirs, including cattle, sheep, goats, pigs, bison, elk, deer, caribou, and dogs. Transmission occurs through breaks in skin after direct contact with an infected animal's tissues, blood, urine, vaginal discharges, placenta, or aborted fetuses. Ingestion of unpasteurized milk or dairy products from an infected animal may also transmit the disease. Inhalation of aerosols has resulted in transmission among animals in pens and stables and with humans in laboratories. Accidental self-inoculation of animal vaccine strains has resulted in a few cases. Rare instances of transmission through human breast milk and sexual contact have been documented.

INCUBATION PERIOD: Highly variable, usually 5-60 days but occasionally several months.

PERIOD OF COMMUNICABILITY: As long as the agent is in an animal's tissues or body fluids. Person-to-person transmission does not occur.

PUBLIC HEALTH SIGNIFICANCE: Brucellosis is a disease that has been nearly eliminated in the U.S. because of vigorous animal health control measures and milk pasteurization. The United States Department of Agriculture (USDA) considers Kansas to be a brucellosis free state. *Brucella* may be used as a biological weapon; however, routine case investigations focus on contaminated dairy products.

REPORTABLE DISEASE IN KANSAS SINCE: 1982

CLINICAL CRITERIA FOR SURVEILLANCE PURPOSES

- An illness characterized by acute or insidious onset of fever, night sweats, undue fatigue, anorexia, weight loss, headache, and arthralgia.

LABORATORY CRITERIA FOR SURVEILLANCE PURPOSES

- Definitive
 - Culture and identification of *Brucella* spp. from clinical specimens
 - Evidence of a fourfold or greater rise in *Brucella* antibody titer between acute- and convalescent-phase serum specimens obtained greater than or equal to 2 weeks apart

➤ Presumptive

- *Brucella* total antibody titer of greater than or equal to 160 by standard tube agglutination test (SAT) or *Brucella* microagglutination test (BMAT) in one or more serum specimens obtained after onset of symptoms
- Detection of *Brucella* DNA in a clinical specimen by PCR assay

SURVEILLANCE CASE DEFINITIONS

➤ *Confirmed*: A clinically compatible illness with definitive laboratory evidence of *Brucella* infection

➤ *Probable*: A clinically compatible illness with at least one of the following:

- Epidemiologically linked to a confirmed human or animal brucellosis case
- Presumptive laboratory evidence, but without definitive laboratory evidence, of *Brucella* infection

EPIDEMIOLOGY AND TRENDS

Two confirmed cases of brucellosis were reported in Kansas during 2014. From 2002 to 2014 a total of eleven confirmed cases have been reported.

Confirmed Cases: 2

Kansas incidence per 100,000 population (2014): 0.07

U.S. incidence per 100,000 population (2013): 0.03

CAMPYLOBACTERIOSIS

CLINICAL FEATURES: An illness characterized by diarrhea, abdominal pain, malaise, fever, nausea, and vomiting. Stools may contain visible or occult blood. Clinical manifestations from *Campylobacter* can range from mild infections lasting 1 to 2 days to severe persistent infections. Occasionally, long-term consequences may result from infection, including Guillain-Barre' syndrome (GBS), a rare disease that affects the nervous system.

CAUSATIVE AGENT: *Campylobacter* spp., a gram-negative bacterium, most commonly *Campylobacter jejuni*.

MODE OF TRANSMISSION: Occurs after ingestion of contaminated liquids (particularly untreated water or unpasteurized milk and juices) or food (undercooked chicken or pork). Direct contact with fecal material from infected animals and person-to-person contact are less frequent causes of infection. Reservoirs include animals, most commonly poultry and cattle. Puppies, kittens, other pets, swine, sheep, rodents, and birds may also be sources of human infection. Chronic infection of poultry and other animals constitutes the primary source of infection.

INCUBATION PERIOD: 1 to 10 days (average 2 to 5 days)

PERIOD OF COMMUNICABILITY: Throughout the course of infection; usually from several days to several weeks; can last from 2 to 7 weeks if not treated with antibiotics.

PUBLIC HEALTH SIGNIFICANCE: *Campylobacter* spp. are an important cause of diarrheal illness in all parts of the world and in all age groups. Common source outbreaks have occurred, most often associated with foods, especially undercooked chicken, unpasteurized milk, and non-chlorinated water.

REPORTABLE DISEASE IN KANSAS SINCE: 1990

LABORATORY CRITERIA FOR SURVEILLANCE PURPOSES

- Isolation of *Campylobacter* from any clinical specimen.

SURVEILLANCE CASE DEFINITIONS

- *Confirmed:* A case that is laboratory confirmed.
- *Probable:* A clinically compatible case that is epidemiologically linked to a confirmed case

EPIDEMIOLOGY AND TRENDS

In 2014, 366 confirmed and probable cases of campylobacteriosis were reported in Kansas. The three-year median for 2011-2013 was 300 cases. Infections are not tracked nationally—no comparable U.S. rate is available.

Confirmed and probable cases ranged in age from less than one year to 92 years. The median age was 36 years. The highest incidence rate occurred in those under 5 years of age (20.9 per 100,000).

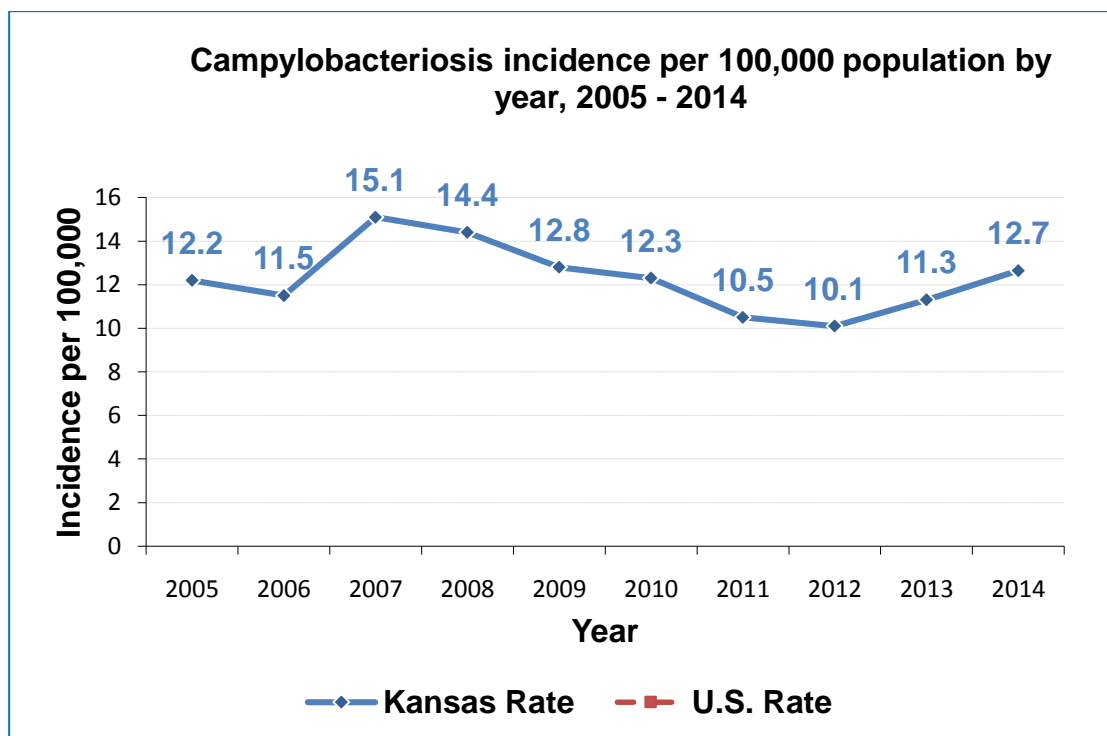
Residents of nonurban counties accounted for 206 (56%) of the confirmed and probable cases.

Information for cases were available on the consumption of raw milk (266 cases with available data), unpasteurized cheese (262 cases with available data), and other non-pasteurized milk products (260 cases with available data). Among the respondents, 11 (4.1%) reported consuming unpasteurized milk, 8 (3.1%) reported consuming unpasteurized cheese, and 2 (0.8%) reported consuming other unpasteurized milk products.

Confirmed and Probable Cases: 366

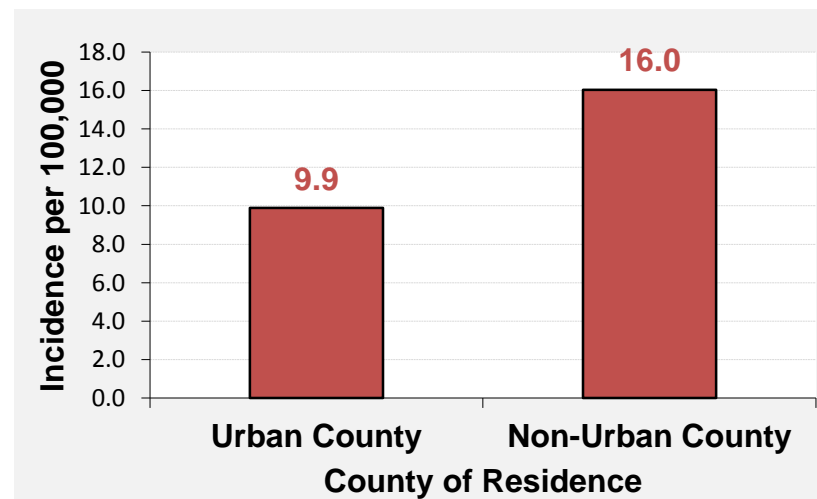
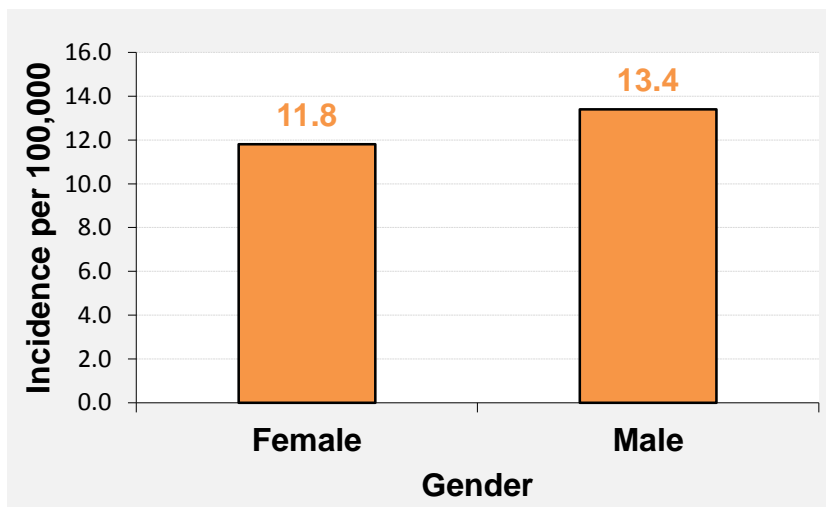
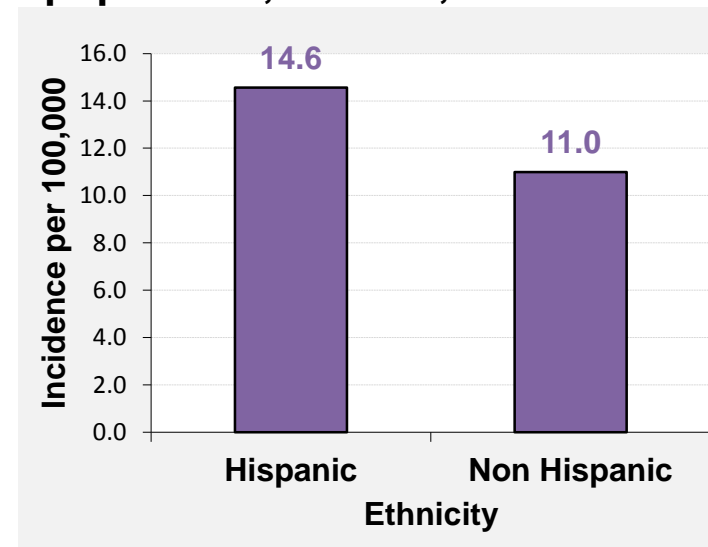
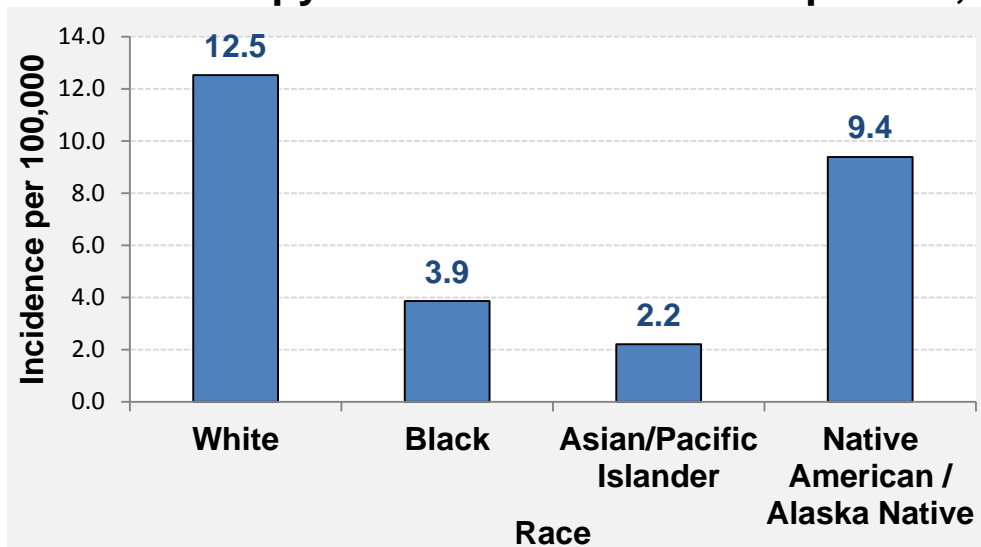
Kansas incidence per 100,000 population (2014): 12.7

U.S. incidence per 100,000 population (2013): N/A

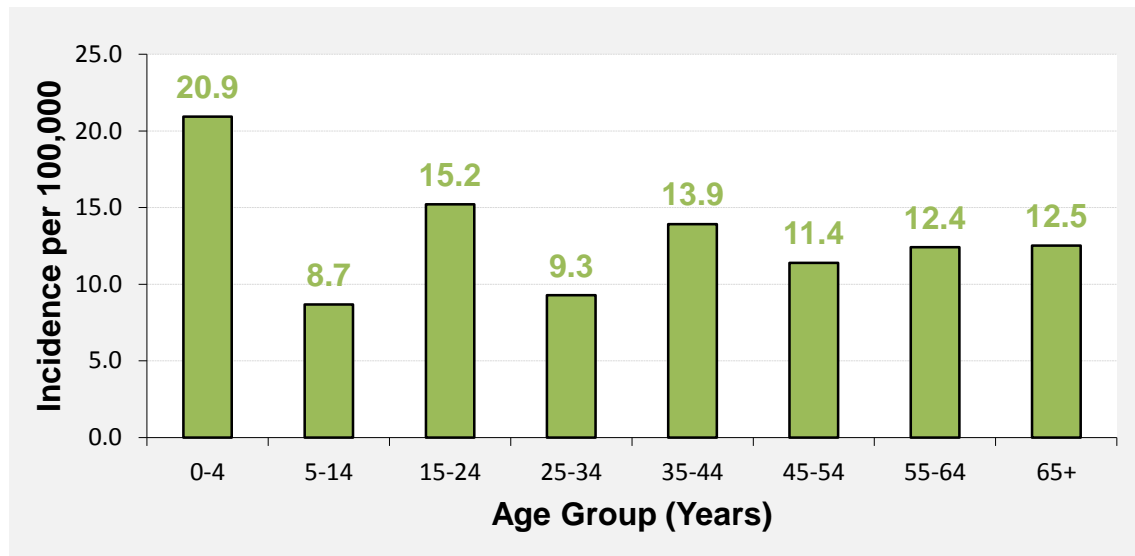


** A comparable U.S. rate is not available*

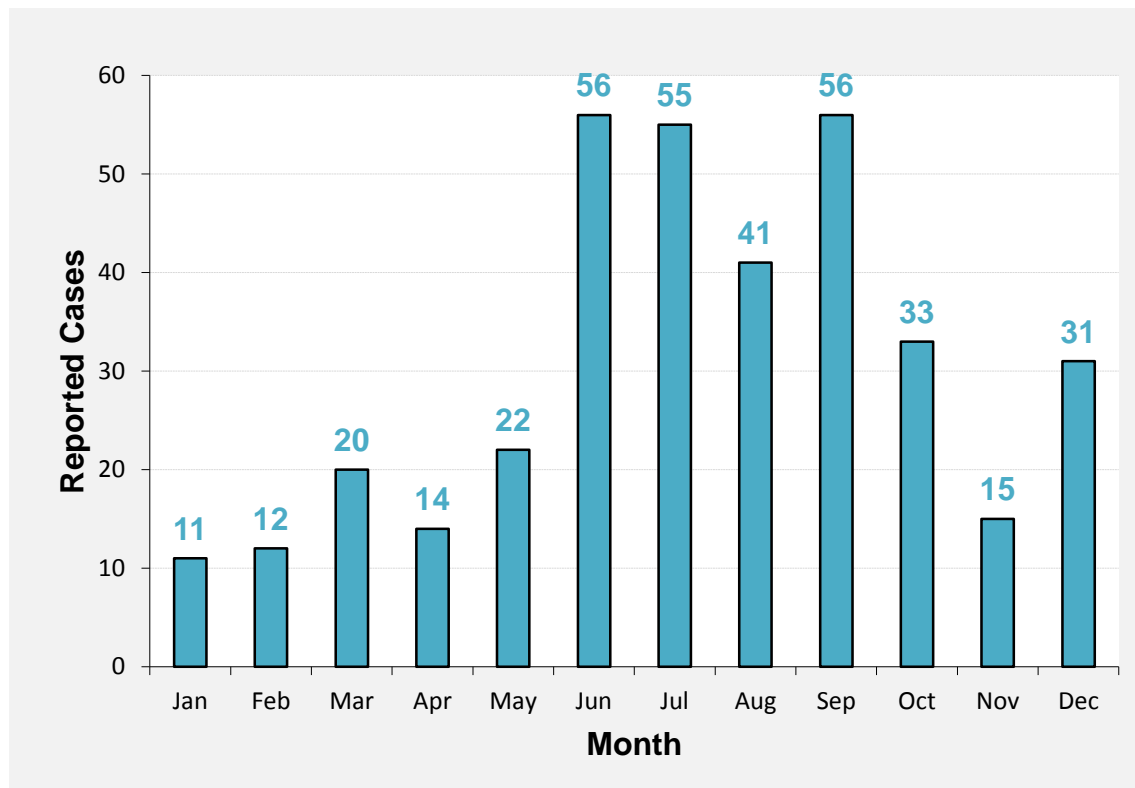
Campylobacteriosis incidence per 100,000 population, Kansas, 2014



Campylobacteriosis incidence per 100,000 population, Kansas, 2014



Campylobacteriosis cases per month Kansas, 2014



CRYPTOSPORIDIOSIS

CLINICAL FEATURES: An illness characterized by profuse, watery diarrhea. Other symptoms that may appear include abdominal cramps, loss of appetite, severe weight loss, low-grade fever, nausea, and vomiting. Symptoms often wax and wane and disappear in two weeks among healthy people. Asymptomatic infections also occur.

CAUSATIVE AGENT: *Cryptosporidium* spp., a spore-forming coccidian protozoan. *C. parvum* and *C. hominis* are the most common species affecting humans.

MODE OF TRANSMISSION: Transmission occurs person-to-person, animal-to-person, waterborne and foodborne via the fecal-oral route. Reservoirs include humans, cattle, and other domestic animals.

INCUBATION PERIOD: 1 to 12 days (average 7 days)

PERIOD OF COMMUNICABILITY: As long as oocysts are present in the stool. Oocysts may be shed in stool from the onset of symptoms to several weeks after symptoms resolve.

PUBLIC HEALTH SIGNIFICANCE: *C. parvum* has been the cause of several large waterborne outbreaks (drinking and recreational) in recent decades. The oocysts are highly resistant to normal amounts of chemical disinfectants, including chlorine, and filtration is needed to remove the oocysts from public water supplies.

With a low infectious dose (as low as 10 organisms) and a long shedding period (sometimes up to 2 months), cryptosporidiosis is extremely contagious and may be easily transmitted person-to-person. Attack rates of 30% to 60% have been reported in outbreaks associated with childcare centers.

Though all individuals are at risk for infection, young children and pregnant women may be more susceptible to dehydration. Illness among immunocompromised individuals, especially persons with HIV/AIDS, may be life-threatening.

REPORTABLE DISEASE IN KANSAS SINCE: 1997

LABORATORY CRITERIA FOR SURVEILLANCE PURPOSES:

- *Confirmed:* Evidence of *Cryptosporidium* organisms or DNA in stool, intestinal fluid, tissue samples, biopsy specimens, or other biological sample by certain laboratory methods with a high positive predictive value (PPV), e.g.,
 - Direct fluorescent antibody [DFA] test,
 - Polymerase chain reaction [PCR],
 - Enzyme immunoassay [EIA], OR
 - Light microscopy of stained specimen.
- *Probable:* The detection of *Cryptosporidium* antigen by a screening test method, such as immunochromatographic card/rapid card test; or a laboratory test of unknown method.

SURVEILLANCE CASE DEFINITIONS

- *Confirmed*: a case that is diagnosed with *Cryptosporidium* spp. infection based on laboratory testing using a method listed in the confirmed criteria.
- *Probable*:
 - A case with supportive laboratory test results for *Cryptosporidia* spp. infection using a method listed in the probable laboratory criteria. When the diagnostic test method on a laboratory test result for cryptosporidiosis cannot be determined, the case can only be classified as probable, OR
 - A case that meets the clinical criteria and is epidemiologically linked to a confirmed case.

EPIDEMIOLOGY AND TRENDS

In 2014, 67 confirmed and probable cryptosporidiosis cases were reported among Kansas residents. The three-year median from 2011-2013 was 100 cases.

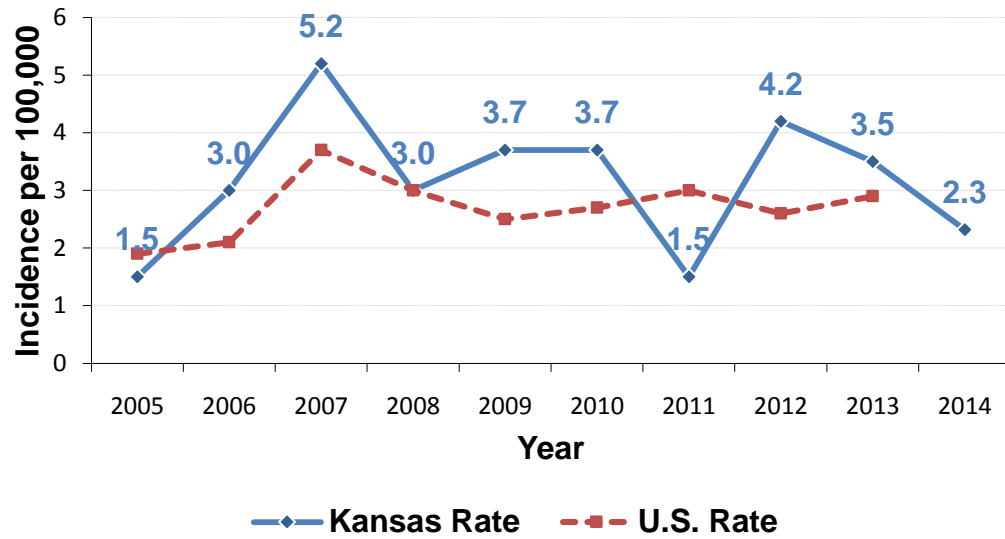
The highest rate of infection (5.48 per 100,000) was among individuals fewer than 5 years of age. Thirty-eight cases (57%) reported contact with animals, 14 cases (21%) reported contact with manure, and 11 cases (16%) reported swimming or wading in recreational water prior to onset of cryptosporidiosis symptoms.

Seventeen (25%) cases were hospitalized, and no deaths were reported.

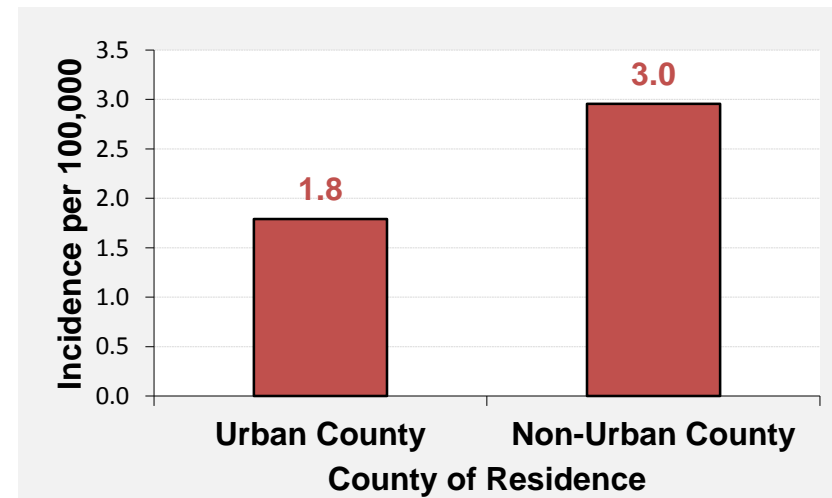
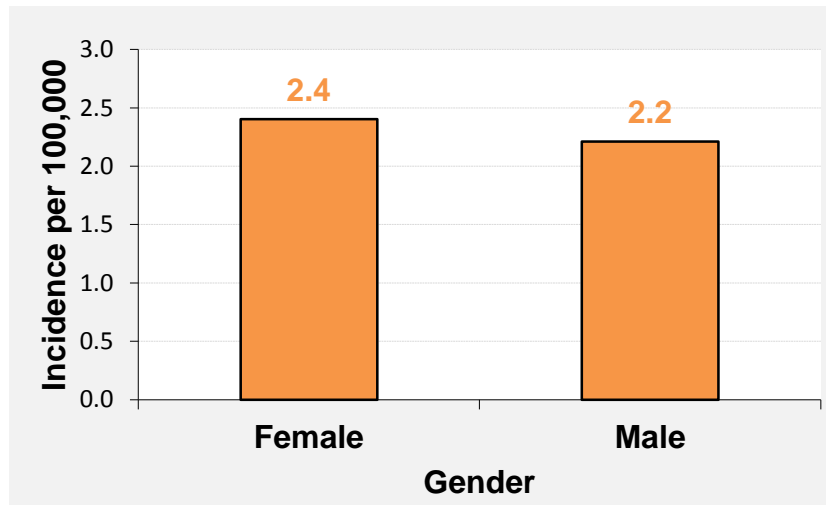
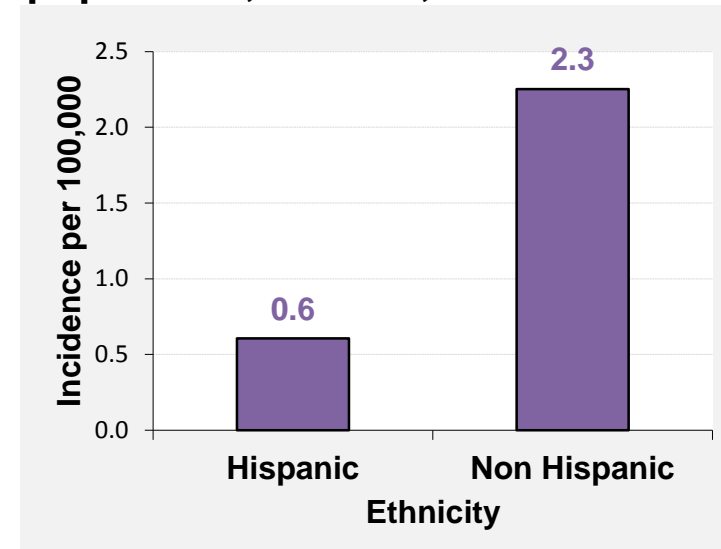
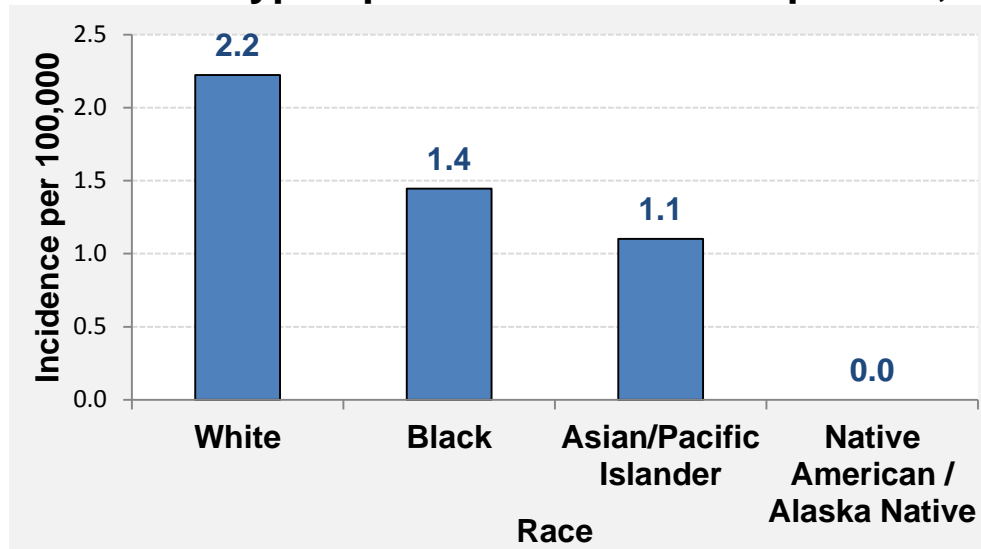
Confirmed and Probable Cases: 67

Kansas incidence per 100,000 population (2014): 2.32
U.S. incidence per 100,000 population (2013): 2.89

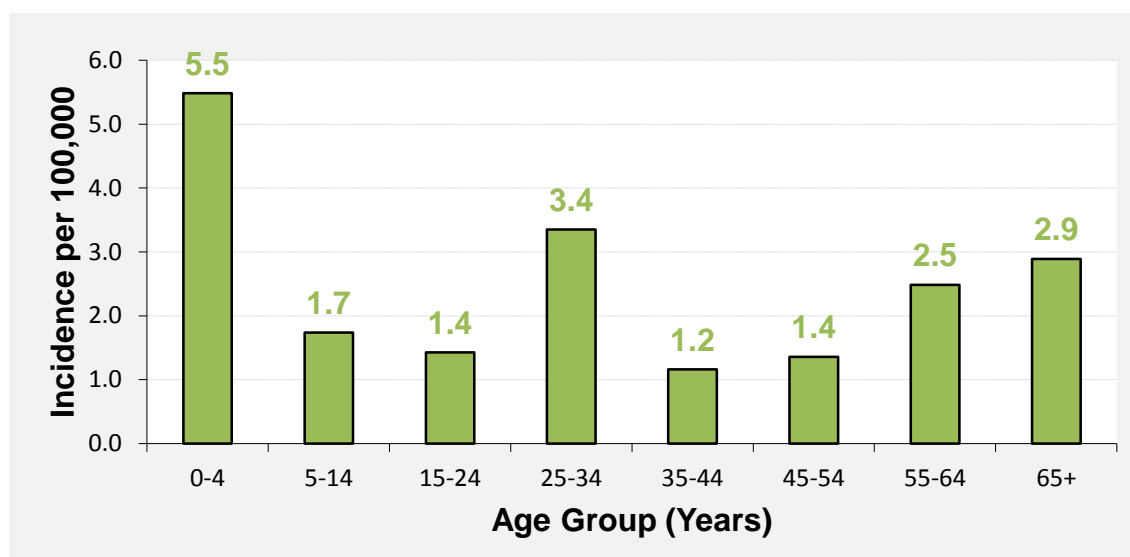
**Cryptosporidiosis incidence per 100,000 population by
year, 2005 - 2014**



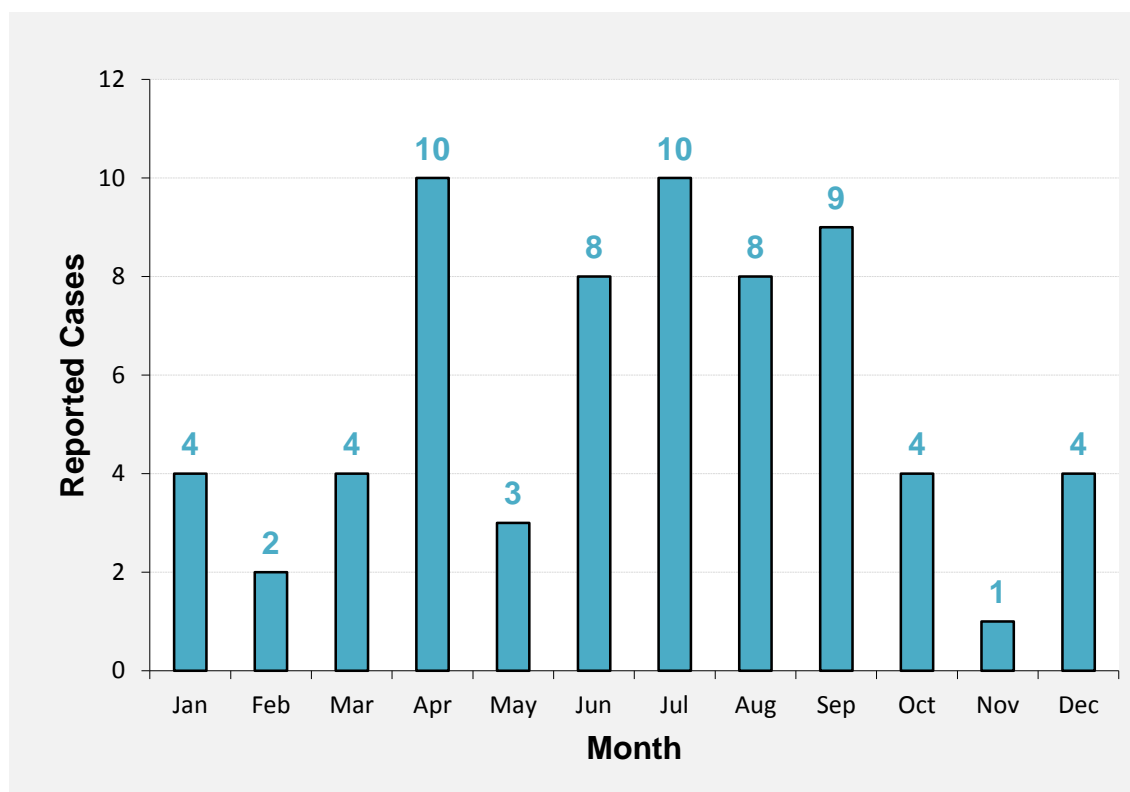
Cryptosporidiosis incidence per 100,000 population, Kansas, 2014



Cryptosporidiosis incidence per 100,000 population, Kansas, 2014



Cryptosporidiosis cases per month Kansas, 2014



CYCLOSPORIASIS

CLINICAL FEATURES: An illness characterized by profuse, watery diarrhea. Other common symptoms include loss of appetite, weight loss, abdominal cramps/bloating, nausea, body aches, and fatigue. Vomiting and low-grade fever also may be noted. Without treatment, symptoms can persist for several weeks to a month or more. Some symptoms, such as diarrhea, can return; and some symptoms, such as muscle aches and fatigue, may continue after the gastrointestinal symptoms have gone away. Asymptomatic infections also occur.

CAUSATIVE AGENT: *Cyclospora cayetanensis*, a protozoan parasite

MODE OF TRANSMISSION: Transmission occurs by ingestion of sporulated oocysts, the infective form of the parasite, in water or food contaminated by feces of an infected animal. An infected person sheds unsporulated (immature, non-infective) *Cyclospora* oocysts in the feces. The oocysts are thought to require days to weeks in favorable environmental conditions to sporulate (become infective). Therefore, direct person-to-person transmission is unlikely, as is transmission via ingestion of newly contaminated food or water.

INCUBATION PERIOD: 2 days to more than 2 weeks (average 7 days)

PERIOD OF COMMUNICABILITY: Direct person-to-person transmission is unlikely; infected persons can shed organisms in their stool for up to a month, but these organisms are not infectious and require time in the environment to mature and sporulate before they are capable of causing infection.

PUBLIC HEALTH SIGNIFICANCE: Cyclosporiasis represents a growing burden of foodborne disease in the United States. Americans traveling to tropical or subtropical regions where *Cyclospora* is endemic may be at increased risk for illness; cases not associated with travel are often associated with imported fresh produce.

REPORTABLE DISEASE IN KANSAS SINCE: 2005

LABORATORY CRITERIA FOR SURVEILLANCE PURPOSES

- *Confirmed:* The detection of *Cyclospora* organisms or DNA in stool, intestinal fluid/aspirate, or intestinal biopsy specimens.

SURVEILLANCE CASE DEFINITIONS

- *Confirmed:* a case that meets the clinical description and at least one of the criteria for laboratory confirmation as described above.
- *Probable:* a case that meets the clinical description and is epidemiologically linked to a confirmed case.

EPIDEMIOLOGY AND TRENDS

Although cyclosporiasis has been reportable in Kansas since 2003, 2013 marked the first cases of the disease reported in the state. Although only one case was reported in Kansas in 2014, increased awareness of the disease and new testing methodologies may increase the number of cases reported.

Confirmed and Probable Cases: 1

Kansas incidence per 100,000 population (2014): 0.03

U.S. incidence per 100,000 population (2013): 0.28

DENGUE FEVER/DENGUE HEMORRHAGIC FEVER

CLINICAL FEATURES: Illness can range from a mild, non-specific febrile syndrome (dengue-like illness) to classic dengue fever (DF), to rare but potentially fatal forms of the disease, dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS).

Classic DF is an acute febrile illness characterized by frontal headache, retro-ocular pain, muscle bone and joint pain and rash. Mild bleeding of nose or gums or easy bruising may be noticed.

DHF may manifest after a 2-7 days febrile phase. After the fever is gone, symptoms including persistent vomiting, severe abdominal pain, and difficulty breathing, may develop at the beginning of a critical phase where the capillaries are excessively permeable with plasma leaking into the peritoneum and pleural cavity.

The critical phase is marked by a low platelet count and hemorrhagic manifestations, tendency to bruise easily or other types of skin hemorrhages, bleeding nose or gums, and possibly internal bleeding.

CAUSATIVE AGENT: The viruses of dengue fever are flaviviruses. The same viruses are responsible for dengue hemorrhagic fever.

MODE OF TRANSMISSION: Bite of infected mosquitoes, principally *Aedes aegypti*. This is a day-biting species, with increased biting activity for 2 hours after sunrise and several hours before sunset.

INCUBATION PERIOD: In humans, symptoms of infected usually begin 4-7 days after the mosquito bite. After entering the mosquito in the blood meal, the virus requires 8-12 days incubation before it can then be transmitted to another human.

PERIOD OF COMMUNICABILITY: Humans transmit virus to mosquitoes during a 3-5 day period usually shortly before through to the end of the febrile period.

PUBLIC HEALTH SIGNIFICANCE: The role of public health is limited to surveillance and education. Prevention is accomplished through adopting personal behaviors to prevent being bitten by mosquitoes, and through destroying mosquito breeding sites.

REPORTABLE DISEASE IN KANSAS SINCE: Not explicitly reportable in Kansas, however, falls under the exotic or newly recognized disease clause.

CLINICAL CRITERIA FOR SURVEILLANCE PURPOSES

Dengue is defined by fever as reported by the patient or healthcare provider and the presence of one or more of the following signs and symptoms:

- Nausea/vomiting
- Rash
- Aches and pains

- Tourniquet test positive
- Leukopenia
- Any warning sign for severe dengue:
 - Abdominal pain or tenderness
 - Persistent vomiting
 - Extravascular fluid accumulation
 - Mucosal bleeding at any site
 - Liver enlargement
 - Increasing hematocrit concurrent with rapid decrease in platelet count

LABORATORY CRITERIA FOR SURVEILLANCE PURPOSES

➤ *Confirmatory:*

- Detection of DENV nucleic acid in serum, plasma, blood, cerebrospinal fluid (CSF), other body fluid or tissue by validated reverse transcriptase-polymerase chain reaction (PCR), or
- Detection of DENV antigens in tissue by a validated immunofluorescence or immunohistochemistry assay, or
- Detection in serum or plasma of DENV NS1 antigen by a validated immunoassay; or
- Cell culture isolation of DENV from a serum, plasma, or CSF specimen; or
- Detection of IgM anti-DENV by validated immunoassay in a serum specimen or CSF in a person living in a dengue endemic or non-endemic area of the United States without evidence of other flavivirus transmission; or
- Detection of IgM anti-DENV in a serum specimen or CSF by validated immunoassay in a traveler returning from a dengue endemic area without ongoing transmission of another flavivirus, clinical evidence of co-infection with one of these flaviviruses, or recent vaccination against a flavivirus; or
- IgM anti-DENV seroconversion by validated immunoassay in acute and convalescent serum specimens
- IgG anti-DENV seroconversion or ≥ 4 -fold rise by a validated immunoassay in serum specimens collected >2 weeks apart, and confirmed by a neutralization test with a >4 -fold higher end point titer as compared to other flaviviruses tested

➤ *Presumptive/Probable:*

- Detection of IgM anti-DENV by validated immunoassay in a serum specimen or CSF in a person living in a dengue endemic or non-endemic area of the United States with evidence of other flavivirus transmission
- Detection of IgM anti-DENV in a serum specimen or CSF by validated immunoassay in a traveler returning from a dengue endemic area with ongoing transmission of another flavivirus, clinical evidence of co-infection with one of these flaviviruses, or recent vaccination against a flavivirus

- *Suspected:*
 - The absence of IgM anti-DENV by validated immunoassay in a serum or CSF specimen collected <5 days after illness onset and in which molecular diagnostic testing was not performed in patient with and epidemiologic linkage

SURVEILLANCE CASE DEFINITIONS

- *Confirmed:* A clinically compatible case of dengue-like illness, dengue, or severe dengue with confirmatory laboratory results.
- *Probable:* A clinically compatible case of dengue-like illness, dengue, or severe dengue with laboratory results indicative of probable infection.
- *Suspect:* A clinically compatible case of dengue-like illness, dengue, or severe dengue with an epidemiologic linkage.

EPIDEMIOLOGY AND TRENDS

In 2014, one probable case of dengue virus infection was reported in Kansas.

Confirmed and Probable Cases: 1

Kansas incidence per 100,000 population (2014): 0.03
U.S. incidence per 100,000 population (2013): 0.27

EHRlichiosis AND ANAPLASMOSIS

CLINICAL FEATURES: Ehrlichiosis and anaplasmosis are infections attributable to different pathogens but with similar signs, symptoms, and clinical courses. All are acute, febrile, bacterial illnesses. The spectrum of disease ranges from subclinical infection to severe, life-threatening, or fatal disease. Symptoms are nonspecific but most commonly include sudden onset of fever, chills, general malaise, headache, muscle and joint pain, sore throat and sleeplessness. Generalized lymphadenopathy with tenderness of the enlarged lymph nodes is common. Complications may include leukopenia, anemia, and hepatitis. Symptoms typically last 1 to 2 weeks, and recovery generally occurs without sequelae; however, neurologic complications have been reported in some children after severe disease. Fatal infections have also been reported.

CAUSATIVE AGENT: *Ehrlichia* spp., gram-negative cocci bacteria, including *Ehrlichia chaffeensis* and *Ehrlichia ewingii*. *Anaplasma* (formerly *Ehrlichia*) *phagocytophilum* causes anaplasmosis.

MODE OF TRANSMISSION: Ehrlichial infections caused by *Ehrlichia chaffeensis* and *E. ewingii* are associated with the bite of the lone star tick (*Amblyomma americanum*). Another tick, *Ixodes scapularis*, is the likely vector of *Anaplasma phagocytophilum*. The reservoirs of *E. chaffeensis* and *E. ewingii* ehrlichiosis are white-tailed deer and dogs. The major reservoirs of *A. phagocytophilum* are ruminants, cervids, and field rodents.

INCUBATION PERIOD: 5 to 10 days after a tick bite or exposure (median=9 days)

PERIOD OF COMMUNICABILITY: No evidence of transmission from person to person.

PUBLIC HEALTH SIGNIFICANCE: Limiting exposure to ticks can prevent infection.

REPORTABLE DISEASE IN KANSAS SINCE: 2000

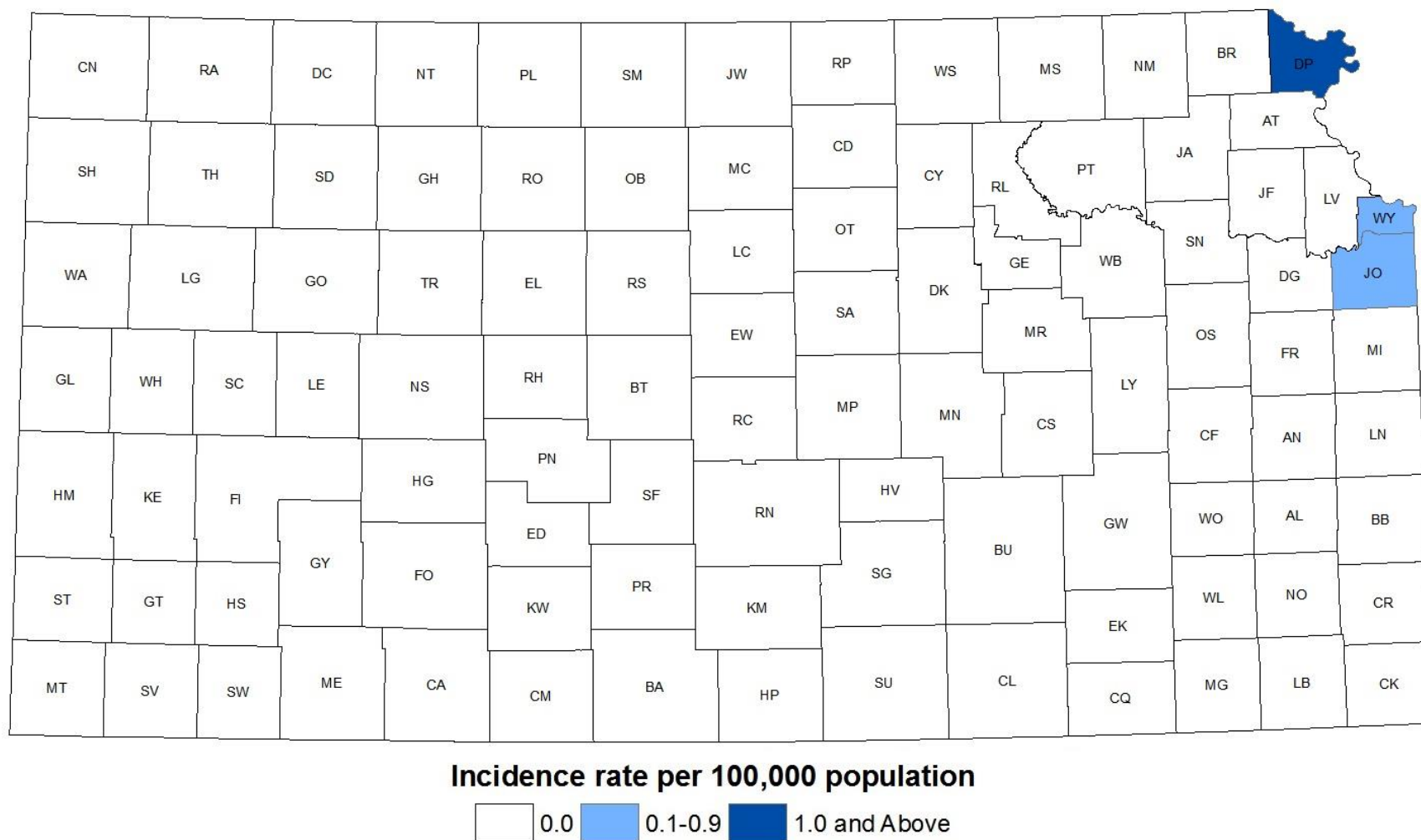
EPIDEMIOLOGY AND TRENDS

In 2014, 55 confirmed and probable cases of ehrlichiosis and anaplasmosis were reported in Kansas: 46 cases were caused by *Ehrlichia chaffeensis* (26 confirmed cases and 20 probable cases), four by *Anaplasma phagocytophilum* (all probable cases), two by *Ehrlichia ewingii* (both confirmed cases), and three probable cases which could not be definitively distinguished as ehrlichiosis or anaplasmosis. Thirty-two (58%) cases of ehrlichiosis and anaplasmosis were hospitalized, and no deaths were reported. Cases ranged in age from 7 to 88 years, with a median age of 58 years. Thirty-eight (69%) cases were age 45 or older. Thirty-four (62%) cases were male. Among cases with known race and ethnicity (n=50), 49 were white, non-Hispanic.

Investigation of reported cases of ehrlichiosis and anaplasmosis includes assessment of where the case was most likely bitten by a tick. The most likely Kansas county of exposure was determined for 47 cases; five cases reported tick exposure outside of Kansas, and the location of tick exposure could not be determined for three cases. All Kansas exposures were reported in the eastern half of the state (Figure 1, Figure 2), which corresponds to the known geographic distribution of the tick vectors, *Amblyomma americanum* and *Ixodes scapularis*.

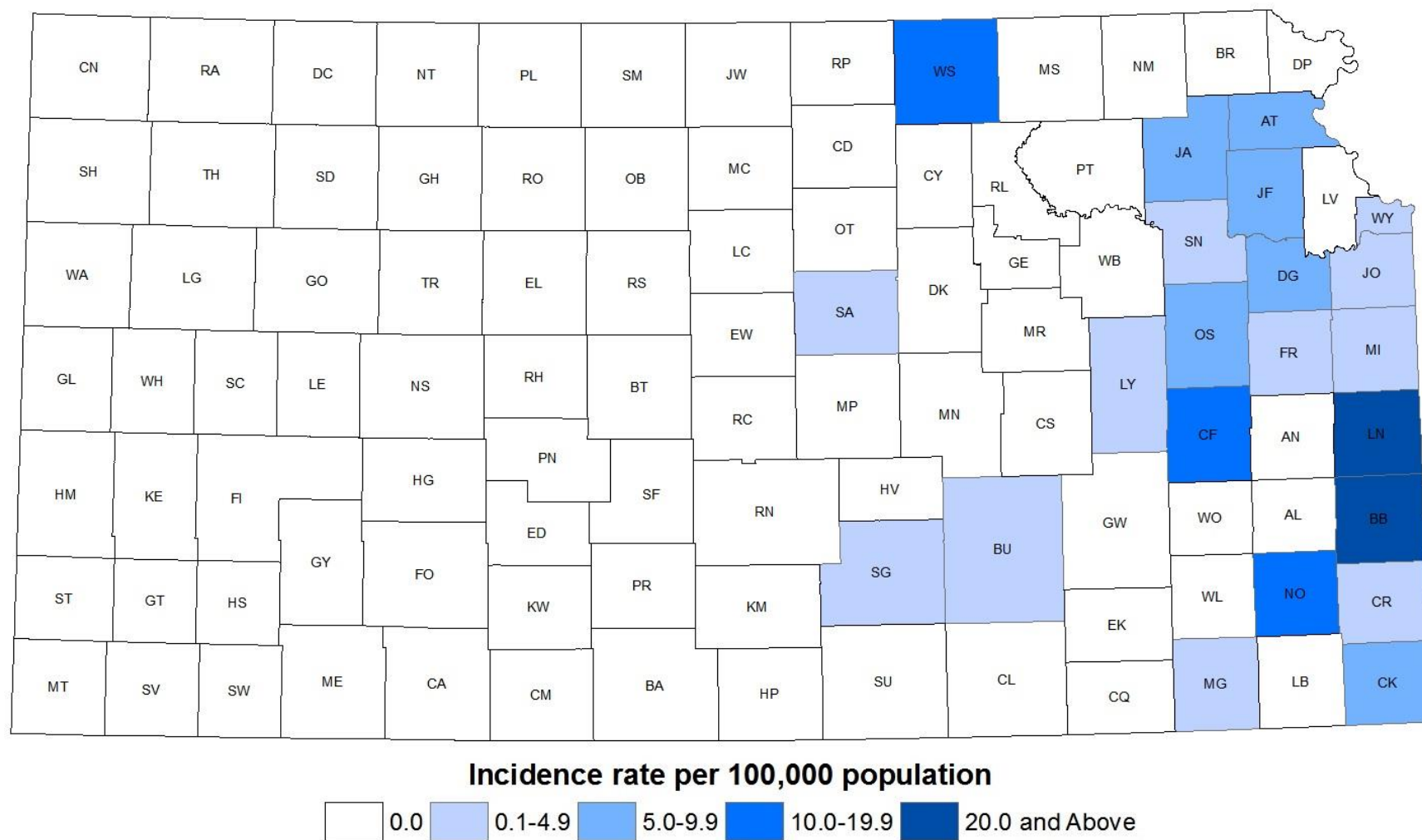
	Ehrlichiosis	Anaplasmosis
Confirmed and Probable Cases:	51	4
Kansas incidence per 100,000 population (2014):	1.75	0.14
U.S. incidence per 100,000 population (2013):	0.52	0.93

Figure 1: Incidence of anaplasmosis per 100,000 population by county or reported tick exposure*, Kansas, 2014 (n=3)



**Cases with reported tick exposure outside their county of residence or unknown exposures were excluded*

Figure 2: Incidence of ehrlichiosis per 100,000 population by county of reported tick exposure*, Kansas, 2014 (n=44)



**Cases with reported tick exposure outside their county of residence or unknown exposures were excluded*

GIARDIASIS

CLINICAL FEATURES: A gastrointestinal illness characterized by diarrhea, abdominal cramps, bloating, frequent loose and pale stools, malabsorption of fat and fat-soluble vitamins, fatigue, and weight loss. In severe giardiasis, damage to the duodenal and jejunal mucosal cells may occur. Infection is often asymptomatic.

CAUSATIVE AGENT: *Giardia lamblia*, a protozoan parasite

MODE OF TRANSMISSION: Transmission is via the fecal-oral route, primarily through ingestion of contaminated drinking or recreational water, and less often from contaminated food. Person-to-person and animal-to-person transmission can occur. While humans are the principal reservoir of the infection, dogs, cats, beavers, and other animals can also be infected.

INCUBATION PERIOD: Ranges from 3-25 days or longer (average of 7-10 days).

PERIOD OF COMMUNICABILITY: Entire period of infection. *Giardia* is often shed in the stool for months.

PUBLIC HEALTH SIGNIFICANCE: Disease may be prevented by promotion of good hand washing. Institutional outbreaks, especially in child day care centers, may result from person-to-person transmission - exclusion policies may apply to infected day care enrollees, food workers, and direct patient care providers.

REPORTABLE DISEASE IN KANSAS SINCE: 1982

LABORATORY CRITERIA FOR SURVEILLANCE PURPOSES

- Detection of *Giardia* organisms, antigen, or DNA in stool, intestinal fluid, tissue samples, biopsy specimens or other biological sample.

SURVEILLANCE CASE DEFINITIONS

- *Confirmed:* a case that meets the clinical description and the criteria for laboratory confirmation as described above. When available, molecular characterization (e.g., assemblage designation) should be reported.
- *Probable:* A case that meets the clinical description and that is epidemiologically linked to a confirmed case.

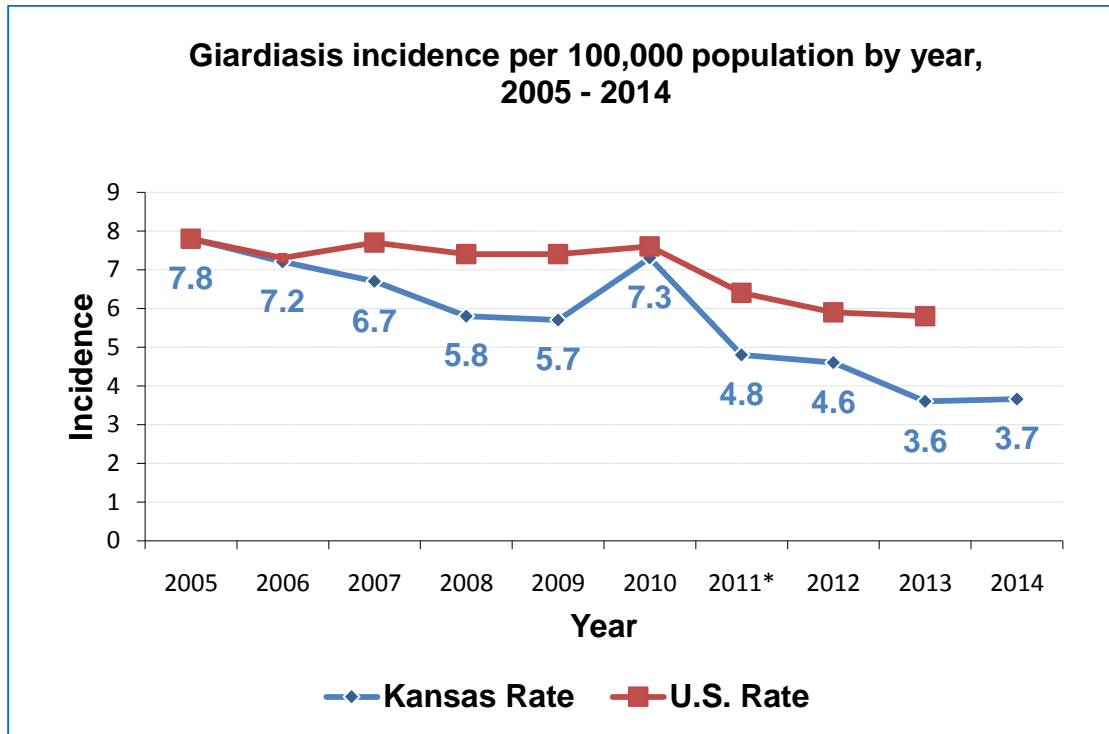
EPIDEMIOLOGY AND TRENDS

In 2014, 106 confirmed and probable cases were reported in Kansas. The three-year median for 2011-2013 was 118.5 cases. Cases ranged in age from one year to 82 years. The median age was 36 years. The highest incidence rate (5.42 per 100,000) occurred in those 45 to 54 years of age.

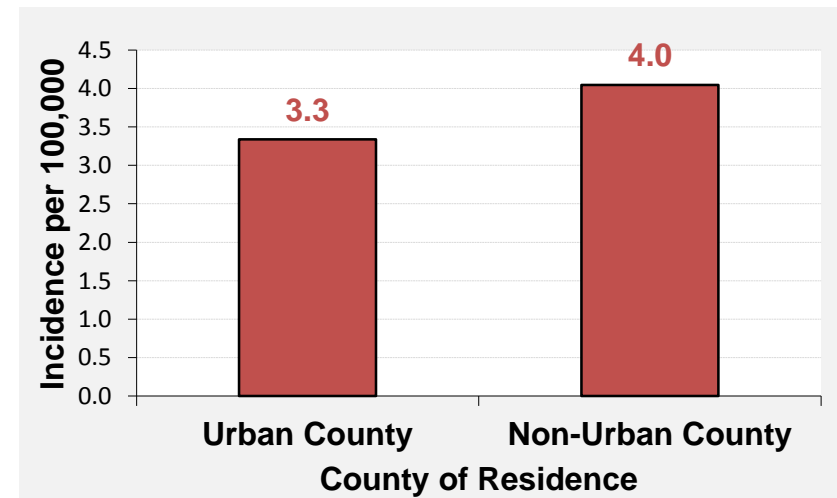
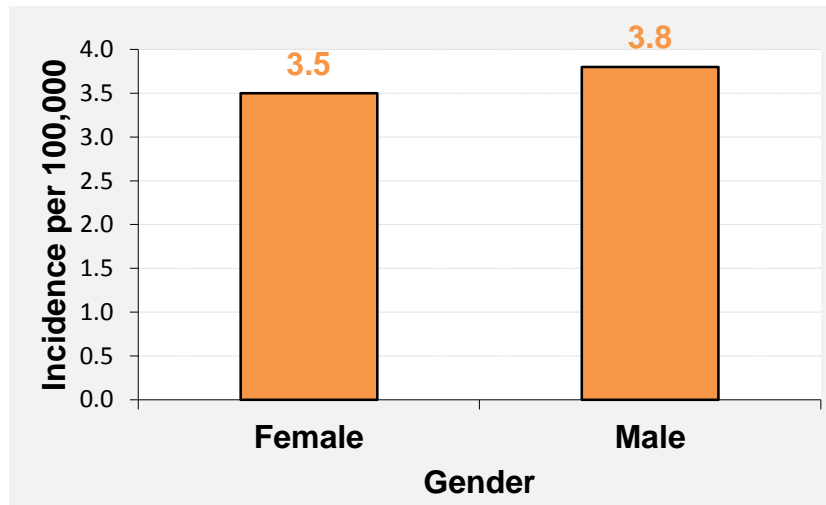
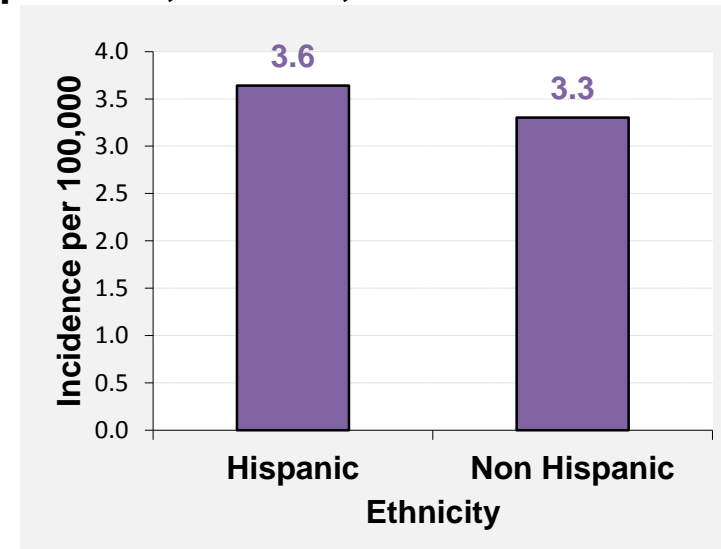
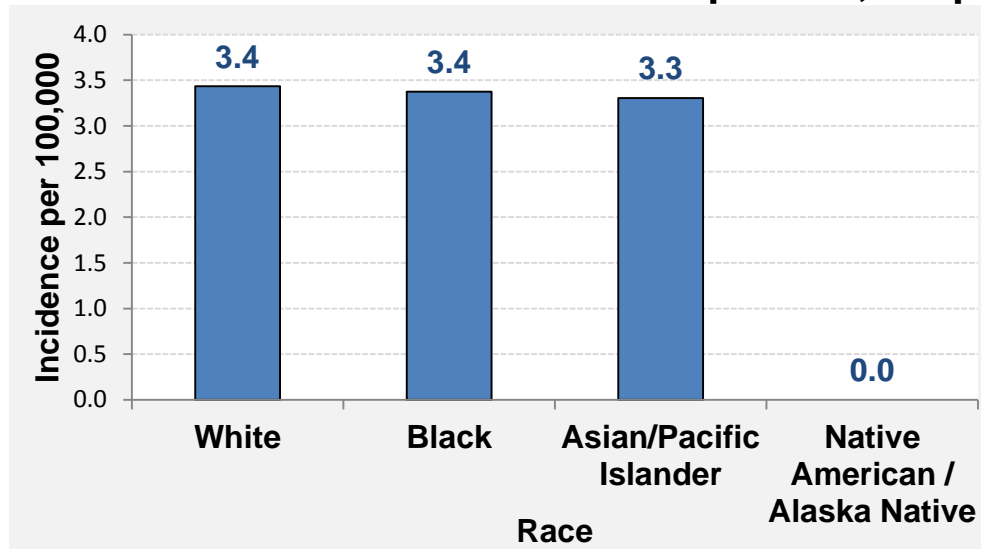
Confirmed and Probable Cases: 106

Kansas incidence per 100,000 population (2014): 3.66

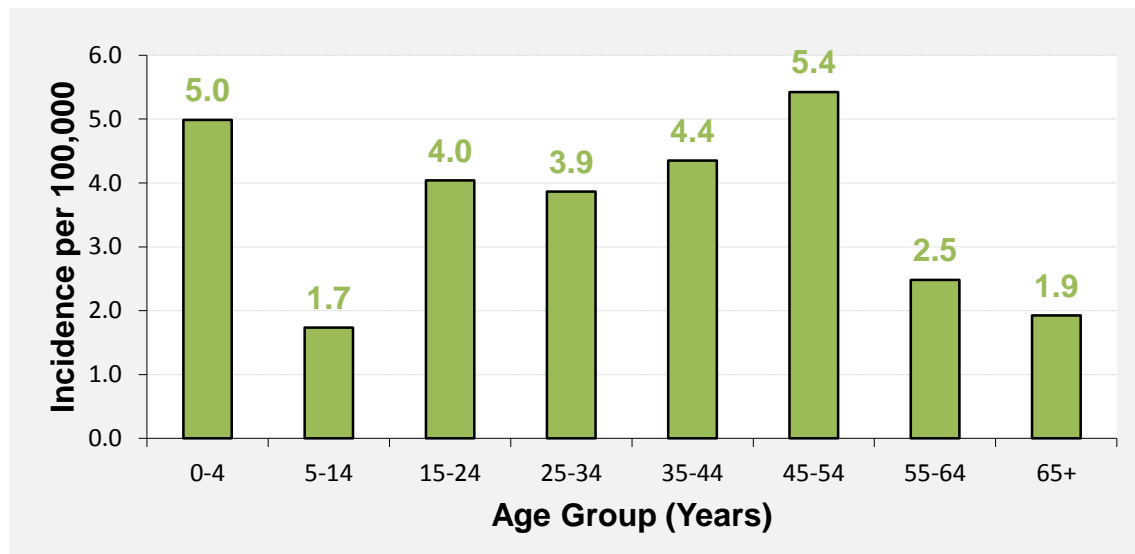
U.S. incidence per 100,000 population (2013): 5.80



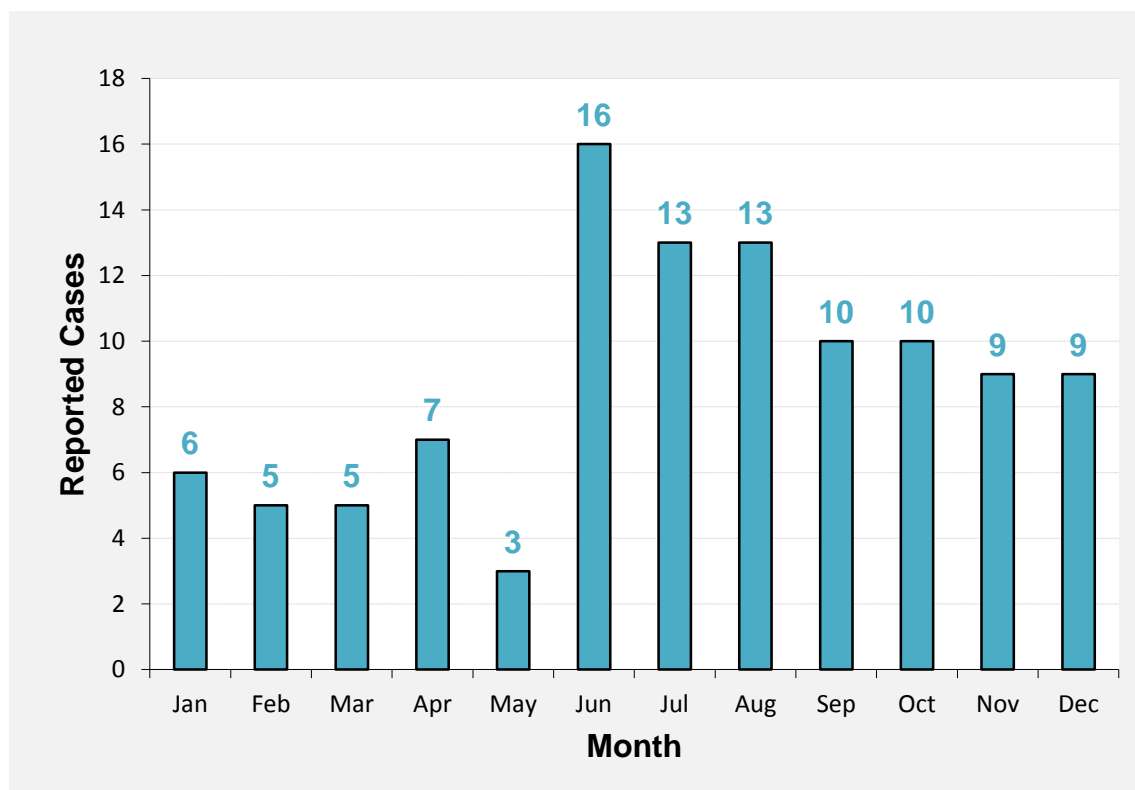
Giardiasis incidence per 100,000 population, Kansas, 2014



Giardiasis incidence per 100,000 population, Kansas, 2014



Giardiasis cases per month Kansas, 2014



HAEMOPHILUS INFLUENZAE, INVASIVE DISEASE

CLINICAL FEATURES: Several clinical syndromes including meningitis, septic arthritis, epiglottitis, cellulitis, bacteremia, and pneumonia may characterize invasive infection. Symptoms of meningitis may include fever, headache, lethargy, vomiting, and stiff neck. Other symptoms depend on the part of the body affected.

CAUSATIVE AGENT: *Haemophilus influenzae*, a gram-negative bacterium with six serotypes (a through f)

MODE OF TRANSMISSION: Found in the upper respiratory tract of humans, the organism may be transmitted by direct contact or droplet inhalation of respiratory tract secretions.

INCUBATION PERIOD: Unknown; probably short, 2-4 days.

PERIOD OF COMMUNICABILITY: As long as organisms are present, which may be for a prolonged period, even without nasal discharge. Considered non-communicable within 24-48 hours after starting effective antibiotic therapy.

PUBLIC HEALTH SIGNIFICANCE: Before *H. influenzae* type B (HiB) conjugate vaccinations, *H. influenzae* type B was the leading cause of invasive diseases among children under 5 years of age. Immunization has been an effective method of limiting invasive HiB disease. Preventive antibiotics may prevent illness in close contacts to known cases of HiB, especially susceptible children.

REPORTABLE DISEASE IN KANSAS SINCE: 1997

EPIDEMIOLOGY AND TRENDS

Confirmed and Probable Cases: 42

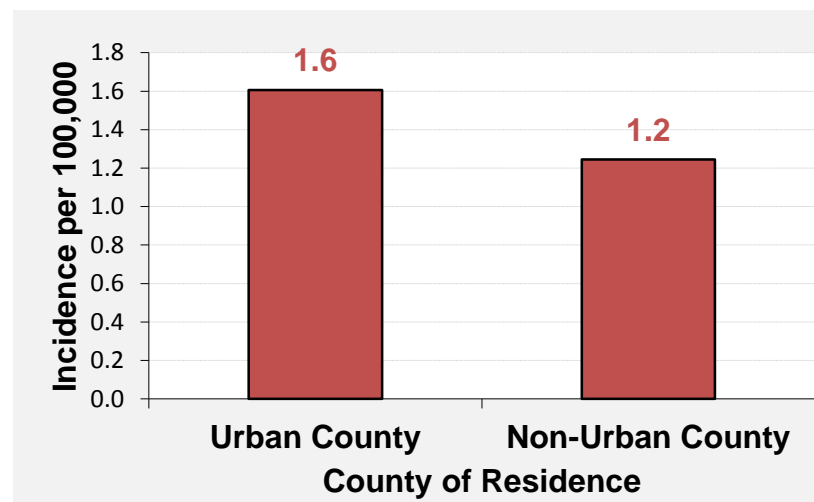
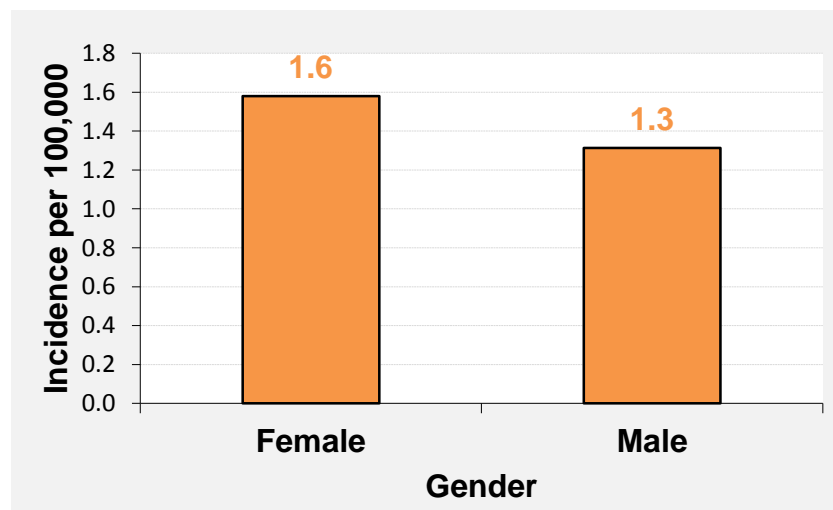
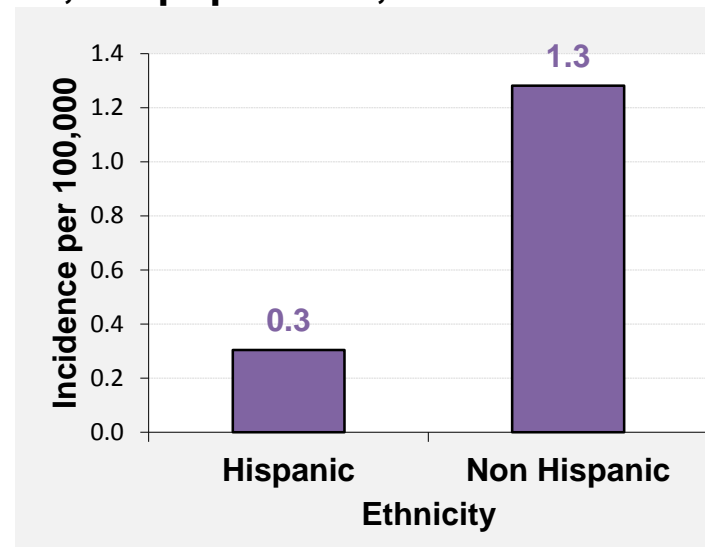
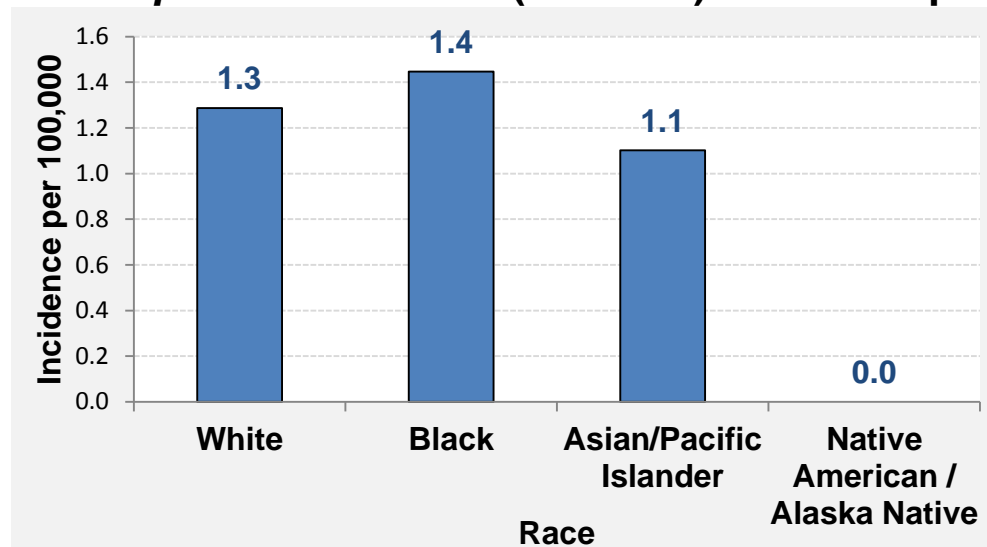
Kansas incidence per 100,000 population (2014): 1.45

U.S. incidence per 100,000 population (2013): 1.21

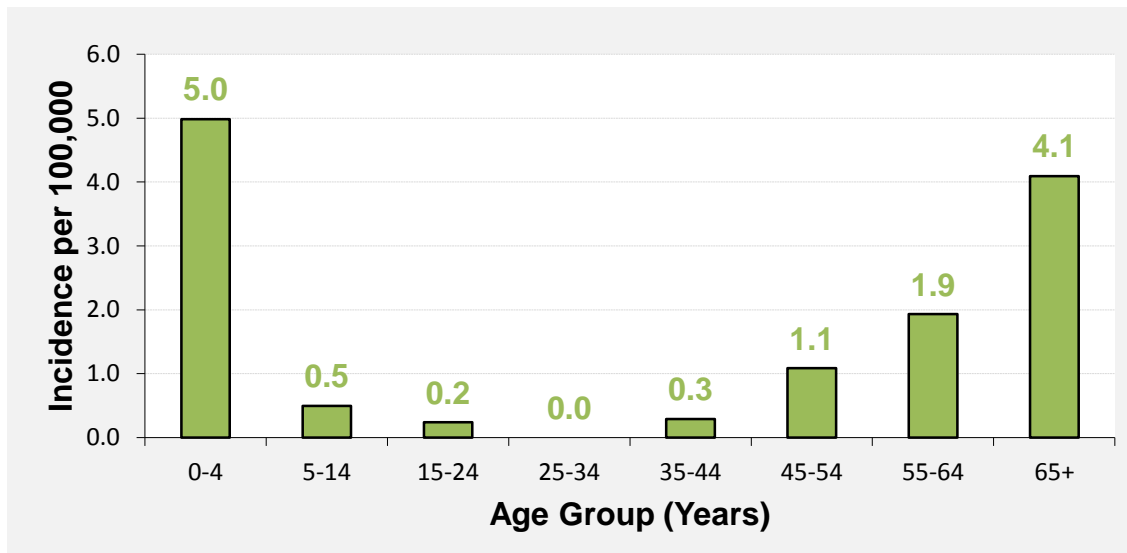
In 2014, there were 42 confirmed cases of invasive *Haemophilus influenzae* infections reported in Kansas. Cases ranged from less than one year of age to 94 years; the median age was 60 years.

Serotyping information was available for 15 bacterial isolates. Only one serotype B (HiB) isolate was identified; the HiB infection occurred in a child too young to be vaccinated and resulted in death. No post-exposure chemoprophylaxis was required for any contacts of the patient.

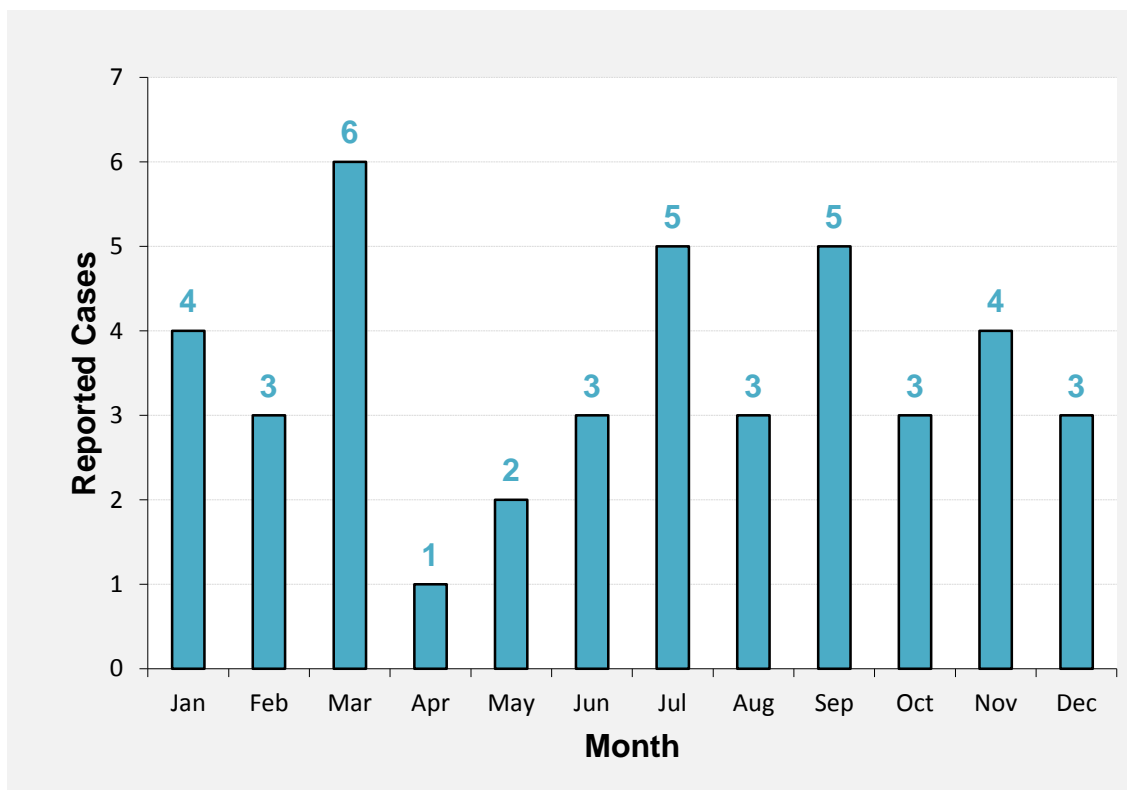
Haemophilus influenzae (invasive) incidence per 100,000 population, Kansas 2014



***Haemophilus influenzae* (invasive) incidence per 100,000 population, Kansas 2014**



***Haemophilus influenzae* (invasive) cases per month Kansas, 2014**



HEMOLYTIC UREMIC SYNDROME, POSTDIARRHEAL

CLINICAL FEATURES: Hemolytic uremic syndrome (HUS) is characterized by the acute onset of microangiopathic hemolytic anemia, renal injury, and low platelet count. Thrombotic thrombocytopenic purpura (TTP) also is characterized by these features but can include central nervous system (CNS) involvement and fever and may have a more gradual onset. Most cases of HUS (but few cases of TTP) occur after an acute gastrointestinal illness (usually diarrheal).

Many patients with HUS require blood transfusions (about 70% of cases) or dialysis (50%); up to a quarter have neurological symptoms including stroke, seizure, or coma. Kidney function returns in up to 70% of HUS cases, but some individuals can experience permanent kidney failure. HUS is fatal in about 5% of cases.

CAUSATIVE AGENT: Shiga toxin-producing bacteria, particularly Shiga toxin-producing *Escherichia coli* (STEC) including *E. coli* O157:H7 which causes an estimated 90% of HUS cases. *Shigella dysenteriae* type 1 may also cause HUS. HUS develops in about 5% of sporadic STEC cases, but in up to 20% of infections with outbreak strains of STEC.

To reduce the likelihood of HUS development, persons with suspected STEC infection should not be treated with beta-lactam antibiotics. Evidence suggests that all antimicrobial therapy should be avoided in persons who may have STEC, particularly in those under 5 years of age.

MODE OF TRANSMISSION: HUS is not transmissible, although its causative agent may be transmitted via the fecal-oral route—susceptible individuals ingest food or liquids contaminated with human or animal feces. Outbreaks have been linked to animal contact, eating undercooked ground beef, consuming contaminated produce, and drinking contaminated water or unpasteurized juice. Person-to-person transmission may also occur, especially within daycare settings and nursing homes.

INCUBATION PERIOD: The incubation period for Shiga toxin-producing *Escherichia coli* (STEC) including *E. coli* O157:H7 ranges from 1 to 10 days; HUS is typically diagnosed a week or more after the onset of diarrhea.

PERIOD OF COMMUNICABILITY: N/A

PUBLIC HEALTH SIGNIFICANCE: HUS is most commonly caused by *E. coli* O157:H7, a bacterium often associated with contaminated beef and food products. Monitoring this disease serves as a potential indicator to problems in meat, fruit, and/or vegetable processing. Risk for HUS may be lowered if *E. coli* O157:H7 enteritis patients are not treated with antimicrobial agents.

REPORTABLE DISEASE IN KANSAS SINCE: 2000

LABORATORY CRITERIA FOR SURVEILLANCE PURPOSES

- Anemia (acute onset) with microangiopathic changes (i.e., schistocytes, burr cells, or helmet cells) on peripheral blood smear, **AND**
- Renal injury (acute onset) evidenced by either hematuria, proteinuria, or elevated creatinine level (i.e., greater than or equal to 1.0 mg/dL in a child aged less than 13 years or greater than or equal to 1.5 mg/dL in a person aged greater than or equal to 13 years, or greater than or equal to 50% increase over baseline)

SURVEILLANCE CASE DEFINITIONS

- *Confirmed*: an acute illness diagnosed as HUS or TTP that both meets the laboratory criteria and began within 3 weeks after onset of an episode of acute or bloody diarrhea
- *Probable*:
 - An acute illness diagnosed as HUS or TTP that meets the laboratory criteria in a patient who does not have a clear history of acute or bloody diarrhea in preceding 3 weeks, **OR**
 - An acute illness diagnosed as HUS or TTP, that a) has onset within 3 weeks after onset of an acute or bloody diarrhea and b) meets the laboratory criteria except that microangiopathic changes are not confirmed

EPIDEMIOLOGY AND TRENDS

In 2014, ten confirmed cases of postdiarrheal hemolytic uremic syndrome were reported in Kansas. The three-year median for 2011-2013 was four cases.

All (100%) were hospitalized; no cases are known to have died. Nine (90%) of the cases tested positive for Shiga toxin-producing *E. coli*; all nine persons had serotype O157. All cases were in persons under 14 years of age. Two cases were associated with an outbreak of Shiga toxin-producing *E. coli*.

Confirmed and Probable Cases: 10

Kansas incidence per 100,000 population (2014): 0.35

U.S. incidence per 100,000 population (2013): 0.11

HEPATITIS A

CLINICAL FEATURES: Abrupt onset of fever, malaise, anorexia, abdominal cramps, and sometimes diarrhea. Jaundice may develop a few days after onset.

CAUSATIVE AGENT: Hepatitis A virus

MODE OF TRANSMISSION: Transmission is through person-to-person, direct fecal-oral contact; consumption of food or beverages contaminated by an infectious person (indirect-fecal oral contact); or consumption of undercooked food exposed to contaminated water or feces (i.e., mollusks, lettuce, strawberries)

INCUBATION PERIOD: 15 to 50 days (average 28 to 30 days)

PERIOD OF COMMUNICABILITY: From the latter half of the incubation period to a maximum of 7 days after the onset of jaundice. This can be as long as one month.

PUBLIC HEALTH SIGNIFICANCE: Hepatitis A incidence has decreased by 95% since 1995 when the inactivated hepatitis A vaccine was licensed. It is very effective in preventing infection, and is recommended for travelers to countries where hepatitis A is a common infection as well as for daycare attendees and high-risk adults and children residing in the US.

The goal of hepatitis A surveillance in Kansas is to identify cases and apply appropriate control measures. Control measures include contact identification and administration of post-exposure prophylaxis (PEP), which consists of either the hepatitis A vaccine or hepatitis A immune globulin (IG). If control measures are completed in a timely fashion, outbreaks can be prevented.

REPORTABLE DISEASE IN KANSAS SINCE: 1982

EPIDEMIOLOGY AND TRENDS

Seven confirmed cases of hepatitis A were reported in Kansas in 2014. The three-year median for 2011-2013 was 11 cases.

Cases ranged in age from 22 to 60 years; the median age was 30 years. The majority of cases (57%) were female, 57% were Asian or Pacific Islander, and for the six cases where ethnicity was documented, 67% were non-Hispanic. There were three hospitalizations but no deaths.

Five contacts were identified; all contacts had previously been vaccinated for hepatitis A, and thus were not recommended to receive either the hepatitis A vaccine or immunoglobulin as post-exposure prophylaxis. No contacts were lost-to-follow-up. No hepatitis A outbreaks were identified in Kansas in 2014. Four investigations (57%) identified foreign travel or exposure to a foreign traveler as a risk factor.

Confirmed Cases: 7

Kansas incidence per 100,000 population (2014): 0.24

U.S. incidence per 100,000 population (2013): 0.57

HEPATITIS B

CLINICAL FEATURES: Acute hepatitis B is an acute illness characterized by anorexia, abdominal discomfort, nausea and vomiting. Jaundice is present in <10% of children and <50% of adults. A low-grade fever, rash, and joint pain may also be present. Chronic hepatitis B illness may or may not demonstrate symptoms of hepatic inflammation. Only about one third of patients have elevated aminotransferase levels, which may fluctuate with intermittent exacerbations of hepatic inflammation. Chronic cases may have no evidence of liver disease or may have a spectrum of disease ranging from chronic hepatitis to cirrhosis or liver cancer.

CAUSATIVE AGENT: Hepatitis B virus

MODE OF TRANSMISSION: Transmission occurs via percutaneous or permucosal exposure: i.e. (1) infected blood or body fluids introduced at birth, (2) through sexual contact, or (3) by contaminated needles. Blood (and serum-derived fluids), saliva, semen, and vaginal fluids have been shown to be infectious. The likelihood of transmission is greater if the *e* antigen or viral DNA is present in an individual's blood.

INCUBATION PERIOD: 45 to 180 days (average 60 to 90 days)

PERIOD OF COMMUNICABILITY: All persons who are hepatitis B surface antigen (HBsAg) positive are potentially infectious; some individuals may clear the surface antigen from their blood, while others may not.

PUBLIC HEALTH SIGNIFICANCE: According to CDC, both acute and chronic hepatitis B cases are major causes of morbidity and mortality in the US. However, transmission of hepatitis B can be interrupted by vaccination and early identification of cases and their contacts. Timely identification of susceptible contacts of hepatitis B cases allows for effective post-exposure prophylaxis. Timely post-exposure prophylaxis is highly effective in preventing hepatitis B transmission from mother to infant. For this reason, all pregnant mothers are required to be tested for hepatitis B during pregnancy.

Routine hepatitis B vaccination is recommended for all children at birth, 1-2 and 6-18 months of age or, if not previously received, at 11-12 years of age. Hepatitis B vaccine is also recommended for persons in the following high risk groups: persons with occupational risk, clients and staff of institutions for the developmentally disabled; hemodialysis patients; recipients of certain blood products; household and sexual partners of HBsAg carriers; international travelers visiting high prevalence areas; injecting drug users; sexually active persons with multiple partners; and inmates of long-term facilities.

Hepatitis D virus causes hepatitis in individuals currently infected with hepatitis B (either acute or chronic); this is because hepatitis D virus cannot replicate without the presence of hepatitis B. Hepatitis D virus is important because it has the ability to cause an asymptomatic or mild chronic hepatitis B infection to become a more severe disease which can result in rapid progression to fulminant hepatitis.

REPORTABLE DISEASE IN KANSAS SINCE: 1982

ACUTE HEPATITIS B

CLINICAL CRITERIA

- An acute illness with a) discrete onset of symptoms **and** b) jaundice or serum aminotransferase levels (ALT) >100 IU/L

LABORATORY CRITERIA FOR SURVEILLANCE PURPOSES

- Hepatitis B surface antigen (HBsAg) positive, **AND**
- IgM antibody to hepatitis B core antigen (IgM anti-HBc) positive (if done)

SURVEILLANCE CASE DEFINITIONS

- *Confirmed:* a case that meets the clinical case definition, is laboratory confirmed, and is not known to have chronic hepatitis B

EPIDEMIOLOGY AND TRENDS

In 2014, twelve confirmed acute cases of hepatitis B were reported in Kansas. The three-year median for 2011-2013 was ten cases.

Cases ranged from 22 to 72 years of age; the median age was 43 years. Nine (75%) cases were male, 92% were White and 92% were non-Hispanic. 83% of patients reported having jaundice, 75% reported having abdominal pain and dark urine, while 67% of patients reporting having fatigue.

Confirmed Cases: 12

Kansas incidence per 100,000 population (2014): 0.41
U.S. incidence per 100,000 population (2013): 0.97

PERINATAL HEPATITIS B

CLINICAL CRITERIA

- Perinatal hepatitis B in the newborn may range from asymptomatic to fulminant hepatitis.

LABORATORY CRITERIA FOR SURVEILLANCE PURPOSES

- Hepatitis B surface antigen (HBsAg) positive.

SURVEILLANCE CASE DEFINITIONS

- *Confirmed:* HBsAg positivity in any infant aged >1-24 months who was born in the United States or in U.S. territories to an HBsAg-positive mother.

EPIDEMIOLOGY AND TRENDS

In 2014, there was one case of perinatal hepatitis B was reported in Kansas.

There were 57 children born to hepatitis B-positive women in Kansas this year. Compared to 2013, Kansas experienced a 25% decrease in the number of children born to women with hepatitis B infection. In 2014, all children born to hepatitis B positive mothers received the hepatitis B vaccine at birth. 97% of infants completed the three dose hepatitis B vaccine series; of these 49% followed up with a post vaccine serological test to ensure immunity had been conferred.

Confirmed Cases: 1

Kansas incidence per 100,000 population (2014): 0.03

U.S. incidence per 100,000 population (2013): 0.02

CHRONIC HEPATITIS B

LABORATORY CRITERIA FOR SURVEILLANCE PURPOSES

- IgM antibodies to hepatitis B core antigen (IgM anti-HBc) negative AND a positive result on one of the following tests: hepatitis B surface antigen (HBsAg), hepatitis B e antigen (HBeAg), or hepatitis B virus (HBV) DNA, **OR**
- HBsAg positive or HBV DNA positive or HBeAg positive two times at least 6 months apart (Any combination of these tests performed 6 months apart is acceptable.)

SURVEILLANCE CASE DEFINITIONS

- *Confirmed:* A case that meets either laboratory criteria for diagnosis

EPIDEMIOLOGY AND TRENDS

In 2014, 138 confirmed cases of chronic hepatitis B were reported in Kansas.¹

Cases ranged from 1 to 81 years of age; the median age was 41 years. Race was reported for 131 (95%) of the cases; 62% of the cases were Asian, 22% of the cases were white, and 10% of the cases were Black/African-American. Of the 74 patients for whom risk factor information was available, 1 (1%) reported injection drug use, one reported blood exposure, and 11 (15%) reported contact with another hepatitis B-positive patient.

Confirmed Cases: 138

Kansas incidence per 100,000 population (2014): 4.77

U.S. incidence per 100,000 population (2013): N/A

¹ Chronic hepatitis B cases reported are those that were first reported to KDHE and confirmed in 2014 (e.g., the case had two positive laboratory results in 2014, 6 months apart).

HEPATITIS C

CLINICAL FEATURES: Initial infection may be asymptomatic or mild (<90% of cases); chronic infection is common (55% to 85% of cases). Approximately 70% of the chronically infected will develop chronic liver disease, cirrhosis or hepatocellular carcinoma. Liver function tests may be elevated or normal during chronic disease.

CAUSATIVE AGENT: The hepatitis C virus is an enveloped RNA virus in the Flaviviridae family.

MODE OF TRANSMISSION: Primarily as a bloodborne pathogen (e.g. sharing of contaminated objects especially needles and syringes) - transmission through sexual contact may also occur, although this is rare.

INCUBATION PERIOD: The incubation period ranges from 2 weeks to 6 months, averaging 6-9 weeks. Acute hepatitis C infection will convert to a chronic carrier state within 6 months if the acute infection does not resolve. Chronic infection may persist for 10 to 20 years prior to onset of symptoms.

PERIOD OF COMMUNICABILITY: Communicability persists as long as virus is present in the body. Chronic cases are considered infectious for life. Peaks in virus concentration correlate with peaks in ALT activity.

PUBLIC HEALTH SIGNIFICANCE: Preventative measures for hepatitis C include behavior modifications that also lower risk factors for acquiring other diseases, such as HIV. While no vaccine exists for hepatitis C, vaccination against hepatitis A and B are recommended for infected individuals.

REPORTABLE DISEASE IN KANSAS SINCE: 2000

ACUTE HEPATITIS C

LABORATORY CRITERIA FOR SURVEILLANCE PURPOSES

One or more of the following three criteria:

- Antibodies to hepatitis C virus (anti-HCV) screening-test-positive with a signal to cut-off ratio predictive of a true positive as determined for the particular assay as defined by CDC. (URL for the signal to cut-off ratios: http://www.cdc.gov/ncidod/diseases/hepatitis/c/sc_ratios.htm), **OR**
- Hepatitis C Virus Recombinant Immunoblot Assay (HCV RIBA) positive, **OR**
- Nucleic Acid Test (NAT) for HCV RNA positive (including genotype)

AND, if done meets the following two criteria:

- IgM antibody to hepatitis A virus (IgM anti-HAV) negative, **AND**
- IgM antibody to hepatitis B core antigen (IgM anti-HBc) negative

SURVEILLANCE CASE DEFINITIONS

Confirmed: a case that meets the clinical case definition, is laboratory confirmed, and is not known to have chronic hepatitis C.

EPIDEMIOLOGY AND TRENDS

Twenty-eight confirmed acute cases of hepatitis C were reported in Kansas in 2014. The three-year median for 2011-2013 was 16 cases. The ages of cases ranged from 19 to 63 years; the median age was 33 years. Race was reported for 26 (93%) cases, and the majority (96%) of cases were Caucasian and Non-Hispanic and 57% of were male. Complete risk factor information was available for 27 (96%) cases. Fourteen (78%) cases had at least one risk factor. Fourteen (52%) of cases reported intravenous drug use, of these, five (36%) reported sharing needles. Five (18%) of cases reported having sexual contact with a hepatitis C positive individual.

Confirmed Cases: 28

Kansas incidence per 100,000 population (2014): 0.97
U.S. incidence per 100,000 population (2013): 0.71

PAST OR PRESENT HEPATITIS C

LABORATORY CRITERIA FOR SURVEILLANCE PURPOSES

One or more of the following three criteria:

- HCV RIBA (recombinant immunoblot assay) positive, **OR**
- Nucleic Acid Test (NAT) positive for HCV RNA (including genotype), **OR**
- Antibodies to hepatitis C virus (anti-HCV) screening-test-positive with a signal to cut-off ratio predictive of a true positive as determined for the particular assay and posted by CDC. (http://www.cdc.gov/ncidod/diseases/hepatitis/c/sc_ratios.htm)

SURVEILLANCE CASE DEFINITIONS

Confirmed: a case that is laboratory confirmed and does not meet the case definition for acute hepatitis C.

EPIDEMIOLOGY AND TRENDS

In 2014, 1,593 confirmed past or present hepatitis C cases were reported. Cases may represent prior unreported infections, individuals who were previously infected but have since cleared the infection, or asymptomatic newly infected individuals.

More infections were reported among males (67.0 per 100,000) than females (42.4 per 100,000).

Race was not reported for 436 (27%) of the cases, and ethnicity was not reported for 556 (31%) of the cases. According to the race data that was collected, hepatitis C was most frequently reported for African-Americans (63.7 per 100,000) and Native Americans (44.6 per 100,000). Improved collection of race and ethnicity information is needed to more definitively describe the burden of chronic hepatitis C prevalence in Kansas.

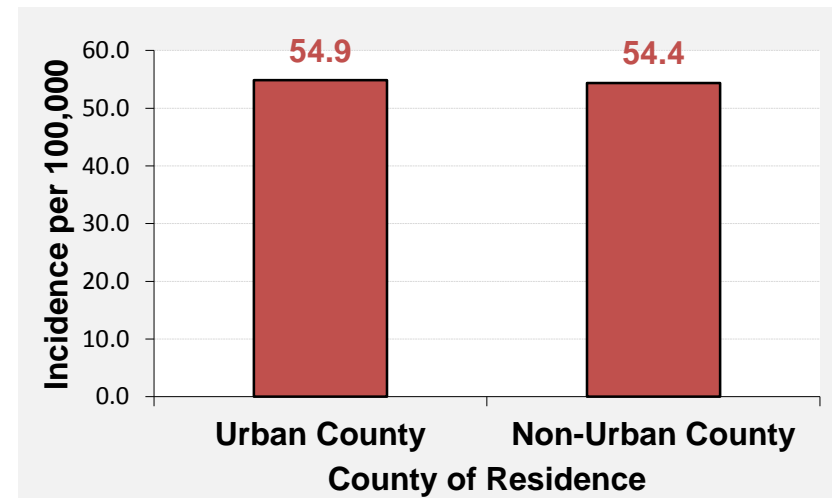
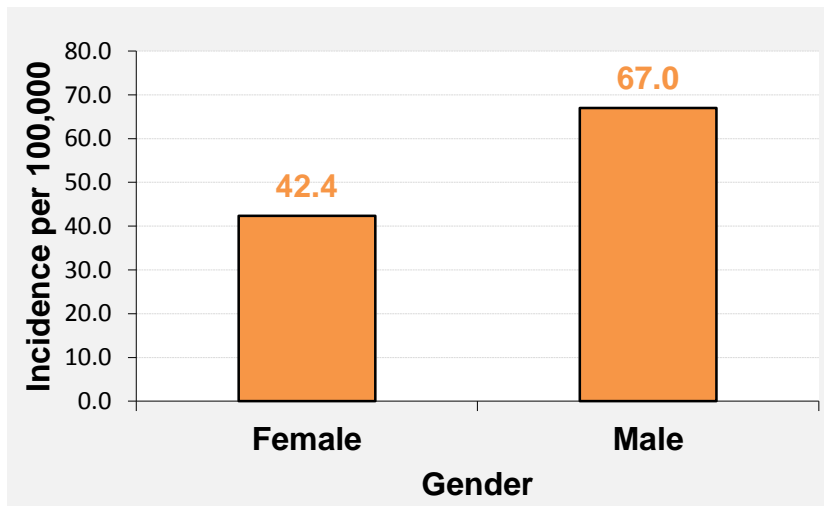
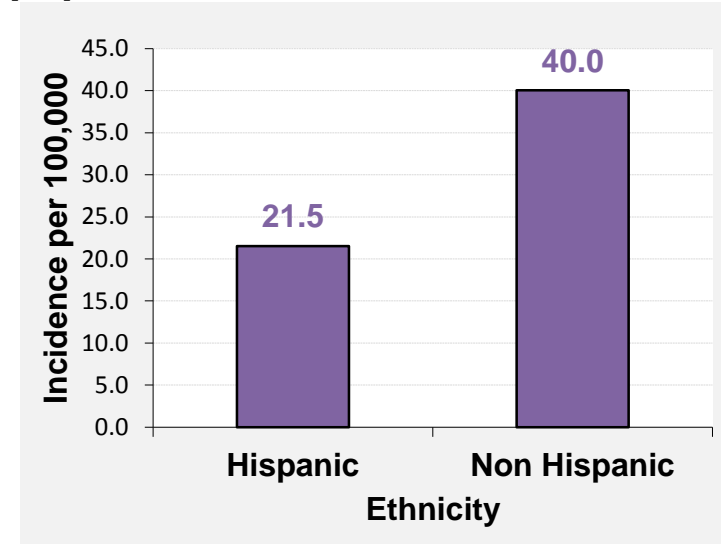
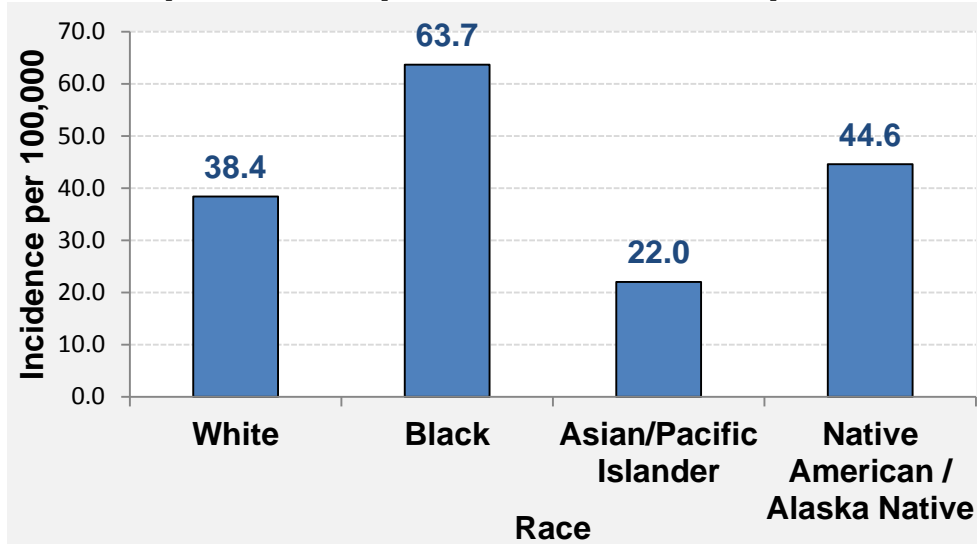
Chronic infections are not tracked nationally—no comparable U.S. rate is available.

Confirmed Cases: 1,593

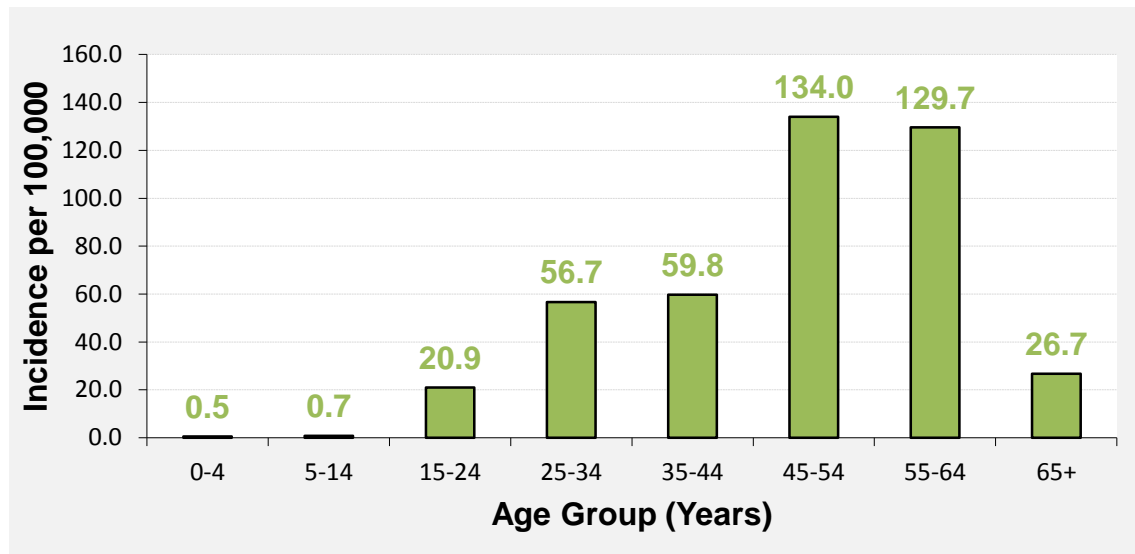
Kansas incidence per 100,000 population (2014): 55.05

U.S. incidence per 100,000 population (2013): N/A

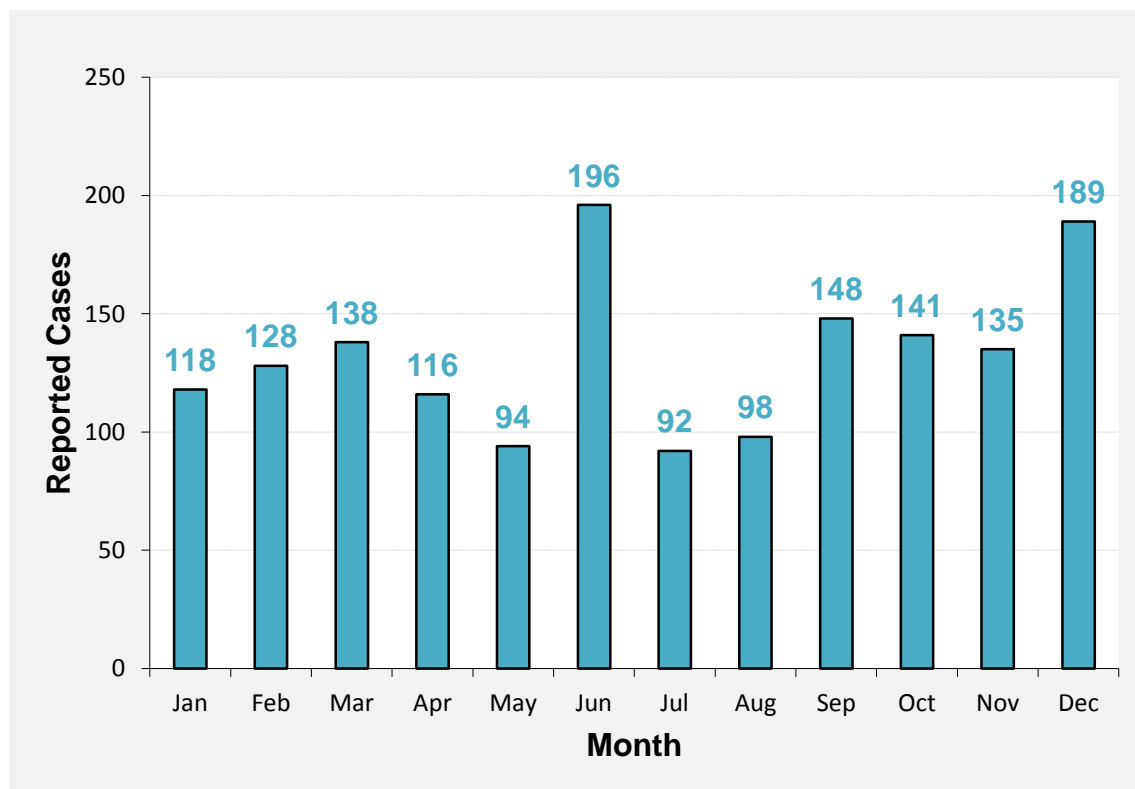
Past or present hepatitis C incidence per 100,000 population, Kansas, 2014



Past or present hepatitis C incidence per 100,000 population, Kansas, 2014



Past or present hepatitis C cases per month Kansas, 2014



INFLUENZA-ASSOCIATED PEDIATRIC MORTALITY

CLINICAL FEATURES: Influenza is characterized by sudden onset of fever, cough, sore throat, and myalgia. Disease is usually mild, but complications, such as secondary bacterial pneumonia, may develop. Estimates of flu-associated deaths in the United States range from a low of about 3,000 to a high of about 49,000. Young children and adults over age 65 are at the highest risk for influenza-related complications and mortality.

CAUSATIVE AGENT: Influenza virus

MODE OF TRANSMISSION: Virus is transmitted from person to person by respiratory droplets, or indirectly through contact with contaminated objects or surfaces.

INCUBATION PERIOD: 1 to 4 days (average 2 days)

PERIOD OF COMMUNICABILITY: Cases may be infectious from one day prior to illness onset to 5 or more days after onset.

PUBLIC HEALTH SIGNIFICANCE: Influenza-associated pediatric deaths became nationally notifiable during the 2003-04 season, in response to several widely publicized cases, to further characterize those children at increased risk of influenza-related complications and deaths and to reassess current vaccination recommendations based on such information.

REPORTABLE DISEASE IN KANSAS SINCE: 2006

LABORATORY CRITERIA FOR SURVEILLANCE PURPOSES

- Laboratory testing for influenza virus infection may be done on pre- or post-mortem clinical specimens, and include identification of influenza A or B virus infections by a positive result by at least one of the following:
 - Influenza virus isolation in tissue cell culture from respiratory specimens;
 - Reverse-transcriptase polymerase chain reaction (RT-PCR) testing of respiratory specimens;
 - Immunofluorescent antibody staining (direct or indirect) of respiratory specimens;
 - Rapid influenza diagnostic testing of respiratory specimens;
 - Immunohistochemical (IHC) staining for influenza viral antigens in respiratory tract tissue from autopsy specimens;

SURVEILLANCE CASE DEFINITIONS

- *Confirmed:* Death in a person less than 18 years of age with:
 - Pre or post-mortem laboratory confirmation of influenza virus infection, **AND**
 - Clinically-compatible illness that does not fully resolve to baseline health status prior to death

EPIDEMIOLOGY AND TRENDS

Confirmed Cases: 4

Kansas incidence per 100,000 population (2014): 0.14

U.S. incidence per 100,000 population (2013): 0.22

Four influenza-associated pediatric deaths were reported in Kansas during 2014. Two occurred during the 2013-2014 influenza season and two occurred during the 2014-2015 season. The median age for all four cases was 2.4 years of age. Three cases did not receive an influenza vaccine during the season of their death.

LEGIONELLOSIS

CLINICAL FEATURES: Infection may result in either of two distinct illnesses: Legionnaires' disease, characterized by fever, myalgia, cough, and pneumonia, and Pontiac Fever, a milder form of the illness without pneumonia.

CAUSATIVE AGENT: *Legionella spp.*, gram-negative bacilli. *L. pneumophila* serogroup 1 is most commonly associated with disease.

MODE OF TRANSMISSION: Inhalation of contaminated aerosols from a soil or water source; other modes are possible, but have not been conclusively proven.

INCUBATION PERIOD: Ranges from 2-10 days. Pontiac Fever has a shorter average incubation period (1-2 days) compared to Legionnaires' disease (5-6 days).

PERIOD OF COMMUNICABILITY: Person-to-person spread has not been documented.

PUBLIC HEALTH SIGNIFICANCE: Legionellosis is an emerging infection that most frequently occurs in the elderly and the immunocompromised. Although most illnesses are sporadic, many outbreaks have been linked to contaminated water tanks, air conditioning cooling towers, evaporative condensers, and soil at excavation sites. Public health goals are outbreak identification and environmental remediation.

REPORTABLE DISEASE IN KANSAS SINCE: 1982

LABORATORY CRITERIA FOR SURVEILLANCE PURPOSES

➤ *Suspect:*

- By seroconversion: fourfold or greater rise in antibody titer to specific species or serogroups of *Legionella* other than *L. pneumophila* serogroup 1 (e.g., *L. micdadei*, *L. pneumophila* serogroup 6) , **OR**
- By seroconversion: fourfold or greater rise in antibody titer to multiple species of *Legionella* using pooled antigen and validated reagents, **OR**
- By the detection of specific *Legionella* antigen or staining of the organism in respiratory secretions, lung tissue, or pleural fluid by direct fluorescent antibody (DFA) staining, immunohistochemistry (IHC), or other similar method, using validated reagents, **OR**
- By detection of *Legionella* species by a validated nucleic acid assay.

➤ *Confirmed:*

- By culture: isolation of any *Legionella* organism from respiratory secretions, lung tissue, pleural fluid, or other normally sterile fluid, **OR**
- By detection of *Legionella pneumophila* serogroup 1 antigen in urine using validated reagents, **OR**
- By seroconversion: fourfold or greater rise in specific serum antibody titer to *Legionella pneumophila* serogroup 1 using validated reagents.

SURVEILLANCE CASE DEFINITIONS

- *Suspect:* a clinically compatible case that meets at least one of the presumptive (suspect) laboratory criteria.
- *Confirmed:* A clinically compatible case that meets at least one of the confirmatory laboratory criteria.

EPIDEMIOLOGY AND TRENDS

In 2014, nineteen confirmed cases of legionellosis were reported in Kansas. The three-year median for 2011-2013 was 16 cases. Cases ranged from 33 to 88 years of age; the median age was 69 years. Older adults were more often affected, with 18 (95%) of cases occurring among individuals greater than 44 years of age. Sixteen cases were hospitalized and there were two reported deaths.

Confirmed Cases: 19

Kansas incidence per 100,000 population (2014): 0.66
U.S. incidence per 100,000 population (2013): 1.58

LISTERIOSIS

CLINICAL FEATURES: Symptoms vary and are dependent on the individual affected. Neonates, elderly, immunocompromised individuals, and pregnant women are at highest risk. Symptoms include fever, malaise, headache, nausea, vomiting, meningitis, septicemia, delirium, and coma. On rare occasion, symptoms may include endocarditis, granulomatous lesions in the liver and other organs, localized internal or external abscesses, and pustular or papular cutaneous lesion. In pregnant women, infection can be transmitted to the fetus, and infants may be stillborn, born with septicemia, or develop meningitis in the neonatal period - even though the mother may be asymptomatic at delivery.

CAUSATIVE AGENT: *Listeria monocytogenes*, a gram-positive bacterium.

MODE OF TRANSMISSION: Ingestion of raw or contaminated milk, soft cheeses, vegetables, pate, unwashed raw vegetables, and ready to eat meats, such as deli meat and hot dogs. Direct contact with infected materials may lead to papular lesions on hands and arms. In utero transmission from mother to fetus may occur; transmission during passage through the infected birth canal is also possible. The principal reservoir of *Listeria monocytogenes* is in soil, forage, water, mud and silage. Other reservoirs include infected domestic and wild mammals, fowl, and people. Asymptomatic fecal carriage is common in humans.

INCUBATION PERIOD: Ranges from 3-70 days (average 3 weeks).

PERIOD OF COMMUNICABILITY: Mothers of infected newborn infants can shed the infectious agent in vaginal discharges and urine for 7-10 days after delivery, rarely longer. However, infected individuals can shed the organisms in their stool for several months.

PUBLIC HEALTH SIGNIFICANCE: Pregnant women, fetuses and newborns infants are highly susceptible. The postpartum course of the mother is usually uneventful, but the case fatality rate is 30% in newborn infants and approaches 50% when onset occurs in the first 4 days. Severe disease in adults, including pregnant women, associated with contaminated food emphasized that older children and adults can have systemic disease with mortality. Listeriosis is often associated with contaminated food products. A product recall may be issued if *Listeria* contamination is suspected.

REPORTABLE DISEASE IN KANSAS SINCE: 2000

LABORATORY CRITERIA FOR SURVEILLANCE PURPOSES

- Isolation of *L. monocytogenes* from a normally sterile site (e.g., blood or cerebrospinal fluid [CSF] or, less commonly, joint, pleural, or pericardial fluid), **OR**
- In the setting of miscarriage or stillbirth, isolation of *L. monocytogenes* from placental or fetal tissues.

SURVEILLANCE CASE DEFINITIONS

- *Confirmed*: A clinically compatible case that is laboratory confirmed.
- *Probable*: A clinically compatible case that is epidemiologically linked to a confirmed case.

EPIDEMIOLOGY AND TRENDS

Six confirmed cases of listeriosis were reported in Kansas in 2014. The three-year median for 2011-2013 was seven cases. Five (83%) cases were hospitalized; no cases were known to be associated with pregnancy and three (50%) deaths were reported.

Confirmed Cases: 6

Kansas incidence per 100,000 population (2014): 0.21
U.S. incidence per 100,000 population (2013): 0.23

LYME DISEASE

CLINICAL FEATURES: A systemic, tick-borne disease, almost never fatal, with manifestations affecting skin, nervous system, heart and/or joints. In early stages, 60%-80% of patients present with a characteristic “bull’s-eye” rash, erythema migrans (EM), accompanied by nonspecific symptoms such as fever, malaise, fatigue, headache, myalgia, and arthralgia. If untreated, some patients may develop arthritis; neurologic abnormalities, such as aseptic meningitis, facial palsy, nerve inflammation and encephalitis; and cardiac problems.

CAUSATIVE AGENT: *Borrelia burgdorferi*, a spirochete bacterium

MODE OF TRANSMISSION: Maintained in the blood and tissues of small rodents and deer, the organism is transmitted by blood to feeding ticks, specifically the *Ixodes* species including the deer tick (*I. scapularis*) and the western black-legged tick (*I. pacificus*). During its feeding process, the infected tick will transmit the organism to humans and other mammals. Transmission occurs after ≥ 24 hours of tick attachment.

INCUBATION PERIOD: After tick exposure, 3-32 days, with an average of 7-10 days.

PERIOD OF COMMUNICABILITY: Person-to-person transmission has not been documented.

PUBLIC HEALTH SIGNIFICANCE: A vaccine against Lyme disease was available in 2001, but has since been withdrawn by the manufacturer. The role of the health department is limited to providing education on the mode of tick transmission and means of personal protection.

REPORTABLE DISEASE IN KANSAS SINCE: 1990

EPIDEMIOLOGY AND TRENDS

Confirmed and Probable Cases: 21

Kansas incidence per 100,000 population (2014):	0.72
U.S. incidence per 100,000 population (2013):	11.62

In 2014, 21 cases of Lyme disease (12 confirmed and 9 probable) were reported in Kansas. Eighteen (52%) cases were female. The median age of cases was 41 years with a range of 3 to 77 years.

Known exposure histories were documented for all confirmed and eight (89%) probable cases. Seven (58%) confirmed cases and six (67%) probable cases reported exposure inside the state of Kansas.

MALARIA

CLINICAL FEATURES: The symptoms of malaria include high fever, chills, rigor, and headache, which may be recurrent and suddenly. If untreated, fever and other symptoms may occur in a cyclical pattern every second or third day. Other commonly associated symptoms include back pain, sweats, myalgia, nausea, vomiting, diarrhea, and cough. Untreated *Plasmodium falciparum* infection can lead to coma, renal failure, pulmonary edema, and death. The diagnosis of malaria should be considered for any person who has these symptoms and who has traveled to an area in which malaria is endemic.

Asymptomatic parasitemia can occur among persons who have been long-term residents of areas in which malaria is endemic.

CAUSATIVE AGENT: *Plasmodium vivax*, *P. ovale*, *P. malaria*, or *P. falciparum*

MODE OF TRANSMISSION: By the bite of an infective female *Anopheles spp.* mosquito. Most species feed at dusk and during early night hours; some important vectors have biting peaks around midnight or early hours of morning. Malaria may also be transmitted by injection or transfusion of blood of infected persons or by use of contaminated needles or syringes, as by drug users. Humans are the only important reservoir of human malaria.

INCUBATION PERIOD: The time between the infective bite and the appearance of clinical symptoms is approximately 9 to 14 days for *P. falciparum*, 12 to 18 days for *P. vivax* and *P. ovale*, and 18 to 40 days for *P. malariae*.

PERIOD OF COMMUNICABILITY: *Plasmodium* may be passed on to biting mosquitoes as long as infective gametocytes are present in human blood; this varies from one to five years depending on the parasite species and response to treatment. The mosquito remains infective for life. Transmission by transfusion may occur as long as asexual forms remain in the circulating blood, up to 40 years. Stored blood can remain infective for at least one month.

PUBLIC HEALTH SIGNIFICANCE: Although malaria is not endemic to the United States or Kansas, it remains a public health threat for several reasons: (1) most persons have no protective immunity and can develop a rapid severe disease, (2) malaria cases can transmit the parasites to local mosquitoes, which in turn can pass it onto local residents. Cases of malaria in Kansas have been reported among individuals with history of foreign travel. Persons traveling to areas at high risk for malaria can protect themselves by taking effective antimalarial drugs and following measures to prevent mosquito bites.

REPORTABLE DISEASE IN KANSAS SINCE: 1982

LABORATORY CRITERIA FOR SURVEILLANCE PURPOSES

- Confirmed infection:
 - Detection of circulating malaria-specific antigens using rapid diagnostic test (RDT), **OR**
 - Detection of species specific parasite DNA in a sample of peripheral blood using a Polymerase Chain Reaction (PCR) test, **OR**

- Detection of malaria parasites in thick or thin peripheral blood films.

SURVEILLANCE CASE DEFINITIONS

- *Confirmed:*
 - a. Detection and specific identification of malaria parasite species by microscopy on blood films in a laboratory with appropriate expertise in any person (symptomatic or asymptomatic) diagnosed in the United States, regardless of whether the person experienced previous episodes of malaria while outside the country, **OR**
 - b. Detection of *Plasmodium* species by nucleic acid test in any person (symptomatic or asymptomatic) diagnosed in the United States, regardless of whether the person experienced previous episodes of malaria while outside the country.
- *Suspect:* Detection of *Plasmodium* species by rapid diagnostic antigen testing without confirmation by microscopy or nucleic acid testing in any person (symptomatic or asymptomatic) diagnosed in the United States, regardless of whether the person experienced previous episodes of malaria while outside the country.

EPIDEMIOLOGY AND TRENDS

In 2014, ten confirmed cases of malaria were reported in Kansas. No deaths were reported; however, five cases were hospitalized. The cases ranged from 21 to 44 years of age, with a median age of 30.5 years. Nine (90%) cases were male. Seven cases were infected with *Plasmodium falciparum* and three were infected with *P. vivax*.

There were nine cases for which case investigation was completed. Of the nine completed investigations, all cases reported travel to or from malaria-endemic regions: Africa (7), India (1), and New Guinea (1). Information regarding malaria chemoprophylaxis was known for seven cases. Five did not receive chemoprophylaxis; two received chemoprophylaxis, but one did not take the drugs as indicated.

Confirmed Cases: 10

Kansas incidence per 100,000 population (2014): 0.35

U.S. incidence per 100,000 population (2013): 0.51

MEASLES

CLINICAL FEATURES: Characterized by a prodrome of increasing fever, cough, coryza, and/or conjunctivitis. Blue-white spots on mucous membranes, Koplic spots, may appear before or after the maculopapular rash. The day rash begins at the hairline, spreads to the face, and then proceeds toward the hands and feet. Nearly one-third of cases result in complications. Diarrhea, otitis media, and pneumonia are the most commonly reported complications.

CAUSATIVE AGENT: The measles virus, a type of paramyxovirus.

MODE OF TRANSMISSION: Direct contact with the saliva of an infected person, droplet spread, and airborne transmission.

INCUBATION PERIOD: Time from exposure to prodrome onset is usually 10-12 days. Time from exposure to rash may range from 7-18 days (average 14 days).

PERIOD OF COMMUNICABILITY: One day prior to prodrome onset to 4 days after rash onset.

PUBLIC HEALTH SIGNIFICANCE: Measles is a vaccine-preventable disease; vaccine is available either as a single vaccine or in a combination vaccine. Exclusions may apply to individuals enrolled in daycare or school. Administration of vaccine or IG may prevent illness in unprotected contacts of cases.

REPORTABLE DISEASE IN KANSAS SINCE: 1990

LABORATORY CRITERIA FOR SURVEILLANCE PURPOSES

- Isolation of varicella virus from a clinical specimen, **OR**
- Varicella antigen detected by direct fluorescent antibody test (DFA), **OR**
- Varicella-specific nucleic acid detected by polymerase chain reaction (PCR), **OR**
- Significant rise in serum varicella immunoglobulin G (IgG) antibody level by any standard serologic assay

SURVEILLANCE CASE DEFINITIONS

- *Confirmed:*
 - Laboratory confirmation by any of the following:
 - positive serologic test for measles immunoglobulin M antibody;
 - significant rise in measles antibody level by any standard serologic assay;
 - isolation of measles virus from a clinical specimen; or
 - detection of measles-virus specific nucleic acid by polymerase chain reaction

OR

- An illness characterized by:
 - generalized rash lasting ≥ 3 days; and
 - temperature $\geq 101^{\circ}\text{F}$ or 38.3°C ; and
 - cough, coryza, or conjunctivitis; and
 - epidemiologic linkage to a confirmed case of measles.

EPIDEMIOLOGY AND TRENDS

Fourteen confirmed cases of measles were reported in Kansas during 2014. The three-year median for 2011-2013 was 6 cases. From 1997 through 2010, a total of three cases had been reported to the state.

Thirteen cases reported in 2014 were associated with outbreaks in Sedgwick and Johnson Counties. The index cases in each county were exposed when visiting persons infected with measles in the Kansas City, Missouri metropolitan area, where a measles outbreak was occurring. The case not associated with an outbreak had a history of international travel.

Confirmed Cases: 14

Kansas incidence per 100,000 population (2014): 0.48

U.S. incidence per 100,000 population (2013): 0.06

MENINGITIS, OTHER BACTERIAL

(non-meningococcal and non-*Haemophilus influenzae* type B)

CLINICAL FEATURES: May include fever, headache, stiff neck, vomiting, and rash.

CAUSATIVE AGENT: For the purposes of this document, "other" bacterial meningitis is defined as an infection of the meninges caused by bacteria other than *Neisseria meningitidis* or *Haemophilus influenzae* type B.

MODE OF TRANSMISSION: Direct person-to-person contact, including respiratory droplets from the nose or throat of infected individuals.

INCUBATION PERIOD: ranges from 2 to 10 days

PERIOD OF COMMUNICABILITY: Untreated patients are most infectious for 2-3 weeks after the illness onset, although transmission may occur until the bacteria are no longer found in respiratory secretions.

PUBLIC HEALTH SIGNIFICANCE: Meningitis caused by *Streptococcus pneumoniae* may be prevented through vaccination. Contacts of non-meningococcal and non-HiB meningitis normally do not require post-exposure prophylaxis.

REPORTABLE DISEASE IN KANSAS SINCE: 1982

EPIDEMIOLOGY AND TRENDS

Confirmed Cases: 3

Kansas incidence per 100,000 population (2014): 0.10

U.S. incidence per 100,000 population (2013): N/A

In 2014, there were three confirmed cases of non-meningococcal, non-*Haemophilus influenzae* type B bacterial meningitis were reported in Kansas. Causative agents were identified for all three cases: two were caused by *Staphylococcus* spp., and one was caused by *Klebsiella oxytoca*. All were hospitalized and no deaths were reported.

MENINGOCOCCAL DISEASE

CLINICAL FEATURES: The disease manifests most commonly as meningitis and/or meningococcemia that may progress rapidly to purpura fulminant, shock, and death. The disease is characterized by sudden onset with fever, intense headache, nausea (often with vomiting), and stiff neck. Up to 15% of the population may carry *N. meningitidis* in the nasopharynx without developing invasive disease, while a few develop bacteremia, sepsis, meningitis, or pneumonia. Even with early diagnosis and appropriate treatment, the fatality rate of meningococcal meningitis is 5-15%.

CAUSATIVE AGENT: Meningococcal disease is an acute bacterial disease caused by *Neisseria meningitidis*, a gram-negative, diplococcus bacterium. The most common serogroups of *N. meningitidis* in the United States are B, C, W-135, and Y.

MODE OF TRANSMISSION: Transmission of *N. meningitidis* is from person to person by direct contact with respiratory droplets from the nose and throat of infected individuals. Late winter to early spring is the peak season for infection, but infections can occur at any time of the year. Humans are the reservoir.

INCUBATION PERIOD: The incubation period is usually three or four days, but may range from two to 10 days.

PERIOD OF COMMUNICABILITY: Individuals are communicable until meningococci are no longer present in the discharges from the nose and mouth. Meningococci usually disappear from the nasopharynx within 24 hours after the institution of appropriate therapy. Penicillin will temporarily suppress the organisms, but will not eradicate them.

PUBLIC HEALTH SIGNIFICANCE: Vaccination and post-exposure prophylaxis are effective in preventing meningococcemia. Vaccines are available to prevent disease caused by types A, C, Y, and W-135. There is no vaccine for serogroup B, historically responsible for 20-30% of reported cases in Kansas. Chemoprophylaxis is used for close contacts of cases (e.g., household members, intimate contacts, health care personnel performing mouth-to-mouth resuscitation, day care center playmates). No chemoprophylaxis is recommended for less intimate contacts (e.g., school classmates, health care workers with minimal contact, etc.) except during an outbreak or in a child care center.

REPORTABLE DISEASE IN KANSAS SINCE: 1982

SURVEILLANCE CASE DEFINITIONS

- *Confirmed:* Isolation of *Neisseria meningitidis*
 - From a normally sterile body site (e.g., blood or cerebrospinal fluid, or, less commonly, synovial, pleural, or pericardial fluid), **OR**
 - From purpuric lesions.

➤ *Probable:*

- Detection of *N. meningitidis*-specific nucleic acid in a specimen obtained from a normally sterile body site (e.g., blood or CSF), using a validated polymerase chain reaction (PCR) assay; **OR**
- Detection of *N. meningitidis* antigen
 - In formalin-fixed tissue by immunohistochemistry (IHC); **OR**
 - In CSF by latex agglutination.

➤ *Suspect:*

- Clinical purpura fulminans in the absence of a positive blood culture; **OR**
- Gram-negative diplococci, not yet identified, isolated from a normally sterile body site (e.g., blood or CSF).

EPIDEMIOLOGY AND TRENDS

One confirmed case of meningococcal disease was reported in Kansas during 2014. The three-year median for 2010-2012 was 3 cases.

The *Neisseria* isolate was forwarded to the state laboratory for serogrouping, and identified as a vaccine-preventable group Y isolate (Table 1). Vaccination history against meningococcal disease was unknown for the case-patient.

Table 1: Reported *Neisseria meningitidis* cases and isolates serogrouped by the Kansas Health and Environmental Laboratories — Kansas, 2005-2014

Year	Cases	Isolates				
		Serogrouped	B	C	Y	W-135
2014	1	1	0	0	1	0
2013	3	3	0	0	2	1
2012	6	5	1	0	2	2
2011	5	4	1	0	3	0
2010	8	7	5	1	1	0
2009	13	6	1	2	3	0
2008	8	5	2	2	1	0
2007	10	7	3	0	1	1
2006	4	3	1	1	1	0
2005	11	11	6	1	4	0

Confirmed Cases: 1

Kansas incidence per 100,000 population (2014): 0.03

U.S. incidence per 100,000 population (2013): 0.18

MUMPS

CLINICAL FEATURES: Characterized by fever, swelling, and tenderness of one or more of the salivary glands: the parotid, the sublingual, and the submaxillary glands. Orchitis may occur in males and oophoritis in females.

CAUSATIVE AGENT: The mumps virus, a type of paramyxovirus.

MODE OF TRANSMISSION: Direct contact with the saliva of an infected person, droplet spread, and airborne transmission.

INCUBATION PERIOD: May range from 12-25 days (average 15-18 days).

PERIOD OF COMMUNICABILITY: Virus has been isolated from saliva a week before overt parotitis and nine days after symptom onset. Cases are most infectious from two days prior to four days after symptom onset.

PUBLIC HEALTH SIGNIFICANCE: Mumps is a vaccine-preventable disease; vaccine is available either as a single vaccine or in combination with rubella and measles (MMR). Exclusions may apply to infected individuals enrolled in daycare or school.

REPORTABLE DISEASE IN KANSAS SINCE: 1982

SURVEILLANCE CASE DEFINITIONS

➤ *Confirmed:*

- Acute onset of unilateral or bilateral tender, self-limited swelling of the parotid and or other salivary gland(s), lasting at least 2 days **OR**
- Clinically compatible illness characterized by: aseptic meningitis, encephalitis, hearing loss, orchitis, oophoritis, parotitis or other salivary gland swelling, mastitis or pancreatitis **AND**

Epidemiologically linked to a confirmed case, **OR**

Has laboratory confirmation by any of the following:

- Isolation of mumps virus from clinical specimen, or
- Detection of mumps nucleic acid (e.g., standard or real time RT-PCR assays), or
- Detection of mumps IgM antibody, or
- Demonstration of specific mumps antibody response in absence of recent vaccination, either a four-fold increase in IgG titer as measured by quantitative assays, or a seroconversion from negative to positive using a standard serologic assay of paired acute and convalescent serum specimens.

➤ *Probable:*

- Acute onset of unilateral or bilateral tender, self-limited swelling of the parotid and or other salivary gland(s), lasting at least 2 days without laboratory confirmation, **AND**
- Epidemiologically linked to a clinically compatible case.

➤ *Suspected:*

- Clinically compatible illness characterized by: aseptic meningitis, encephalitis, hearing loss, orchitis, oophoritis, parotitis or other salivary gland swelling, mastitis or pancreatitis without laboratory testing. **OR**
- Acute onset of unilateral or bilateral tender, self-limited swelling of the parotid and or other salivary gland(s), lasting at least 2 days without laboratory testing, **OR**
- A person without clinical information but with any of the following laboratory tests suggestive of mumps:
 - Isolation of mumps virus from clinical specimen, **OR**
 - Detection of mumps nucleic acid (e.g., standard or real time RT-PCR assays), **OR**
 - Detection of mumps IgM antibody, **OR**
 - Demonstration of specific mumps antibody response in absence of recent vaccination, either a four-fold increase in IgG titer as measured by quantitative assays, or a seroconversion from negative to positive using a standard serologic assay of paired acute and convalescent serum specimens.

EPIDEMIOLOGY AND TRENDS

In 2014, two confirmed cases of mumps were reported in Kansas. The cases ranged in age from nine to 21 years of age. Both of the cases had been vaccinated against mumps.

Confirmed Cases: 2

Kansas incidence per 100,000 population (2014): 0.07
 U.S. incidence per 100,000 population (2013): 0.19

PERTUSSIS (WHOOPING COUGH)

CLINICAL FEATURES: A prolonged, paroxysmal cough with characteristic inspiratory "whoop" is the primary symptom; post-tussive vomiting may also occur. Infants may present with apnea or cyanosis, while adults may present only with a chronic spasmodic cough.

CAUSATIVE AGENT: *Bordetella pertussis*, a bacillus bacterium.

MODE OF TRANSMISSION: Contact with respiratory secretions of infected persons.

INCUBATION PERIOD: Ranges from 4-21 days (average 7-10 days).

PERIOD OF COMMUNICABILITY: Most transmissible in the period before cough becomes paroxysmal. Communicability gradually decreases and becomes negligible after three weeks. Patients are considered infectious until five days after beginning treatment.

PUBLIC HEALTH SIGNIFICANCE: Pertussis affects all age groups, but the disease is most severe in infants and young children. A vaccine exists to prevent illness in this age group (i.e., children under seven years old). In addition, a booster vaccine is licensed for those ≥ 11 years of age (including individuals 65 years and older).

REPORTABLE DISEASE IN KANSAS SINCE: 1982

SURVEILLANCE CASE DEFINITIONS

➤ *Confirmed:*

- Acute cough illness of any duration, with isolation of *B. pertussis* from a clinical specimen; **OR**
- Cough illness lasting ≥ 2 weeks, with at least one of the following symptoms:
 - paroxysms of coughing; **OR**
 - inspiratory "whoop"; **OR**
 - post-tussive vomiting; **OR**
 - apnea, with or without cyanosis (for infants aged <1 year only); **AND**
 - polymerase chain reaction (PCR) positive for pertussis; **OR**
- Illness lasting ≥ 2 weeks, with at least one of the following symptoms:
 - paroxysms of coughing; **OR**
 - inspiratory "whoop"; **OR**
 - post-tussive vomiting; **OR**
 - apnea, with or without cyanosis (for infants aged <1 year only); **AND**
 - contact with a laboratory-confirmed case of pertussis.

➤ *Probable:*

- In the absence of a more likely diagnosis, a cough illness lasting ≥ 2 weeks, with at least one of the following symptoms:
 - paroxysms of coughing; **OR**

- inspiratory "whoop"; **OR**
- post-tussive vomiting; **OR**
- apnea, with or without cyanosis (for infants aged <1 year only); **AND**
- absence of laboratory confirmation; **AND**
- no epidemiologic linkage to a laboratory-confirmed case of pertussis; **OR**
- For infants aged <1 year only:
 - Acute cough illness of any duration, with at least one of the following symptoms:
 - paroxysms of coughing; **OR**
 - inspiratory "whoop"; **OR**
 - post-tussive vomiting; **OR**
 - apnea (with or without cyanosis); **AND**
 - PCR positive for pertussis; **OR**
 - Acute cough illness of any duration, with at least one of the following symptoms:
 - paroxysms of coughing; **OR**
 - inspiratory "whoop"; **OR**
 - post-tussive vomiting; **OR**
 - apnea (with or without cyanosis); **AND**
 - contact with a laboratory-confirmed case of pertussis.

*Note: An illness meeting clinical case definition should be classified as “probable” rather than “confirmed” if it occurs in a patient who has contact with an infant aged <1 year who is PCR positive for pertussis and has ≥ 1 sign or symptom and cough duration <14 days.

EPIDEMIOLOGY AND TRENDS

In 2014, 431 cases (309 confirmed and 122 probable) of pertussis were reported in Kansas. Cases ranged in age from younger than one month to 88 years; the median age was 10 years. The incidence was highest (55.8 per 100,000 population) among children 0-4 years of age followed by children 5-14 years of age (40.1 per 100,000 population).

All persons reported a cough illness (Table 1). Duration of cough was reported by 99% (427/431) of cases and ranged from 6 to 117 days (median, 26 days). Of those that reported duration of cough, 99% had a cough lasting at least two weeks.

Table 1: Symptoms reported among persons with pertussis, Kansas, 2014

Symptom	# of Cases with Symptoms	# of Cases with Information (%)
Cough	431	431 (100%)
Paroxysms	409	427 (96%)
Whoop	153	405 (38%)
Post-tussive vomiting	210	421 (50%)
Apnea	74	417 (18%)

There were 240 cases tested for pertussis by PCR and 230 (96%) were positive. Seven cases were tested by culture and all (100%) were positive.

Twenty-seven percent (116/431) of cases were completely unvaccinated against pertussis (Table 2).

Table 2: Vaccination status of persons with pertussis by age group, Kansas, 2013 (n=114)*

Age Group	# of Cases	# of Unvaccinated Cases (%)
<6 months	29	17 (59%)
6 months to <1 year	15	6 (40%)
1 to 4 years	68	29 (43%)
5 to 9 years	93	37 (40%)
10 to 14 years	74	11 (15%)
15 to 19 years	35	0 (0%)
≥20 years	115 **	15 (13%)

*2 cases did not have age documented

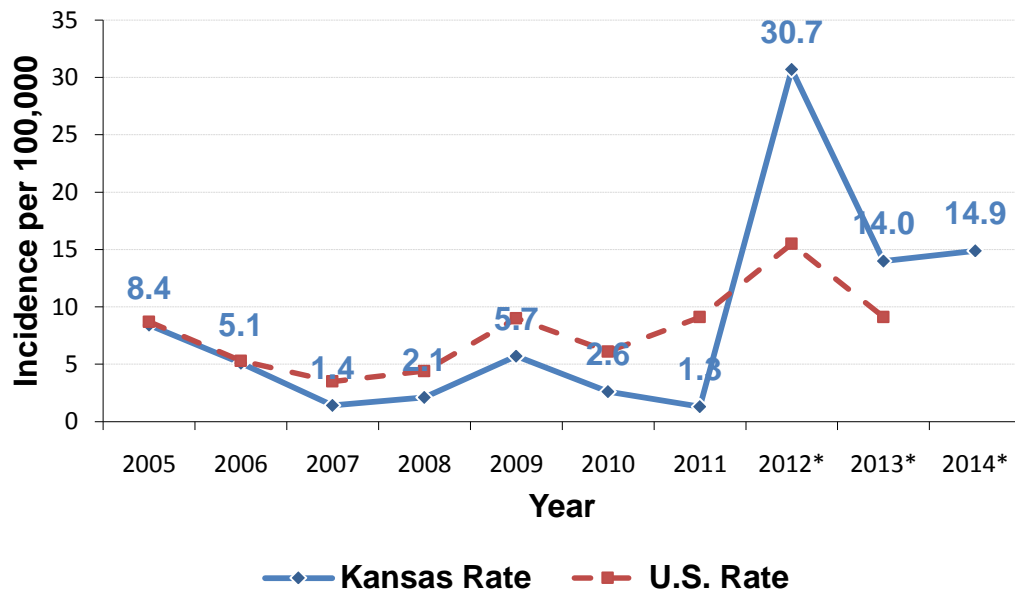
**54 cases had unknown vaccination status

One-hundred seventy-four cases were linked to seven individual outbreaks in Harvey, Marion, McPherson, Montgomery, Pratt, Pottawatomie, and Sedgwick counties. Incidence was highest in these counties (Figure 1).

Confirmed and Probable Cases: 431

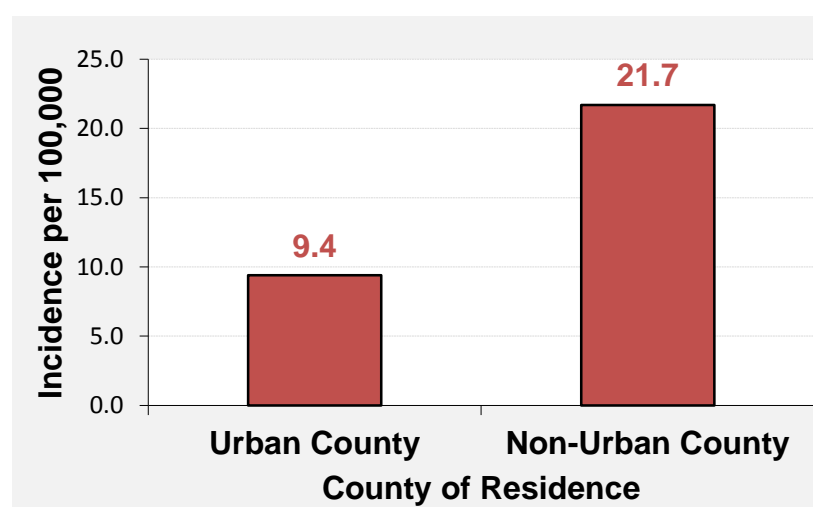
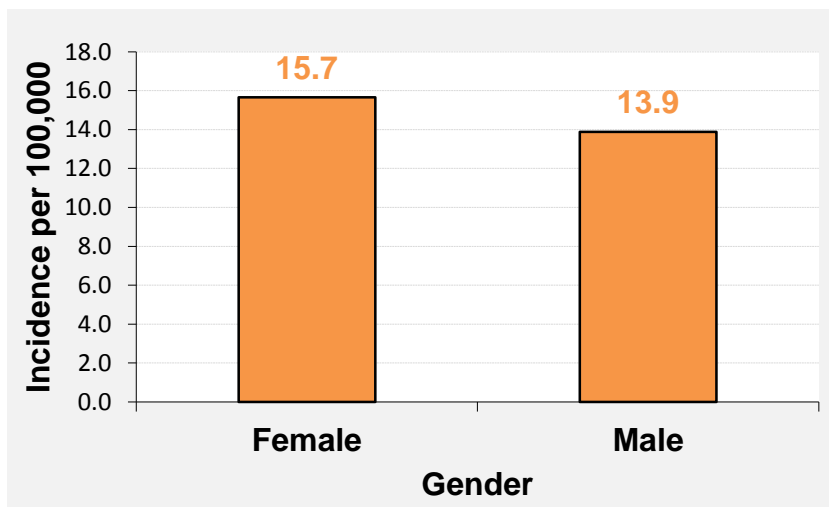
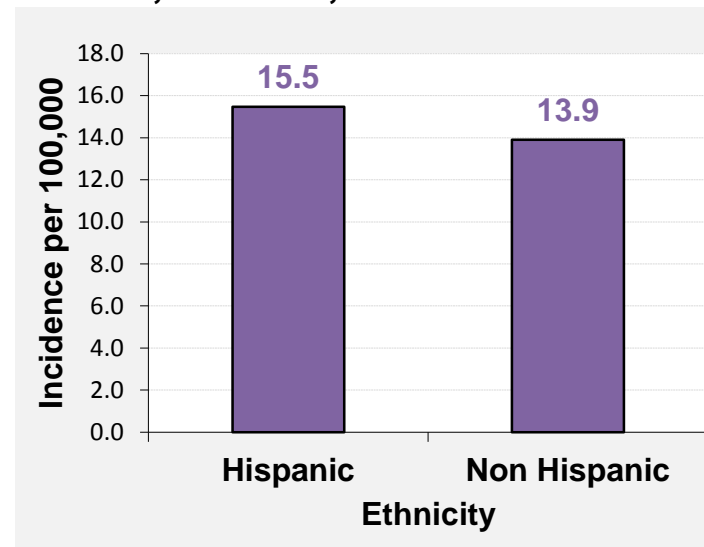
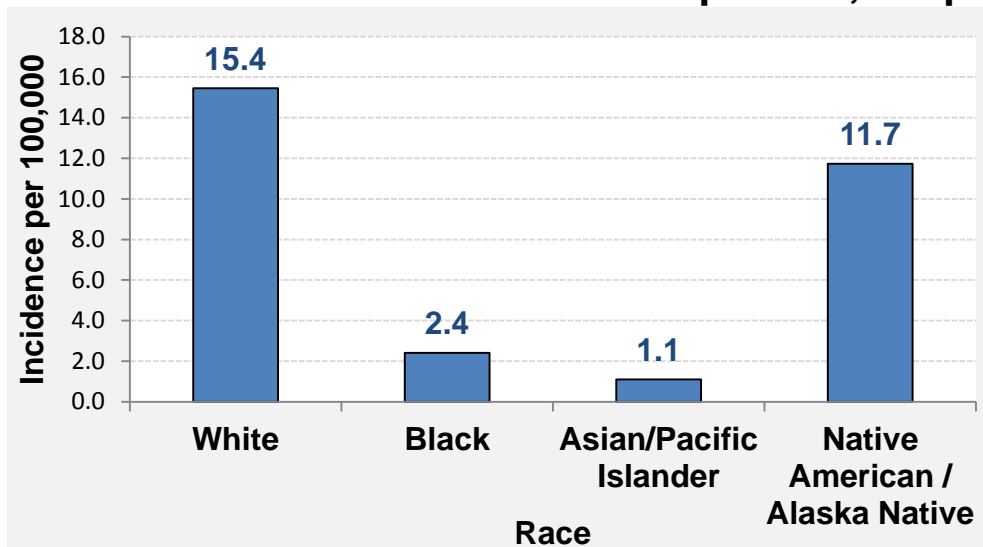
Kansas incidence per 100,000 population (2014): 14.89
U.S. incidence per 100,000 population (2013): 9.12

**Pertussis incidence per 100,000 population by year, 2005
- 2014**

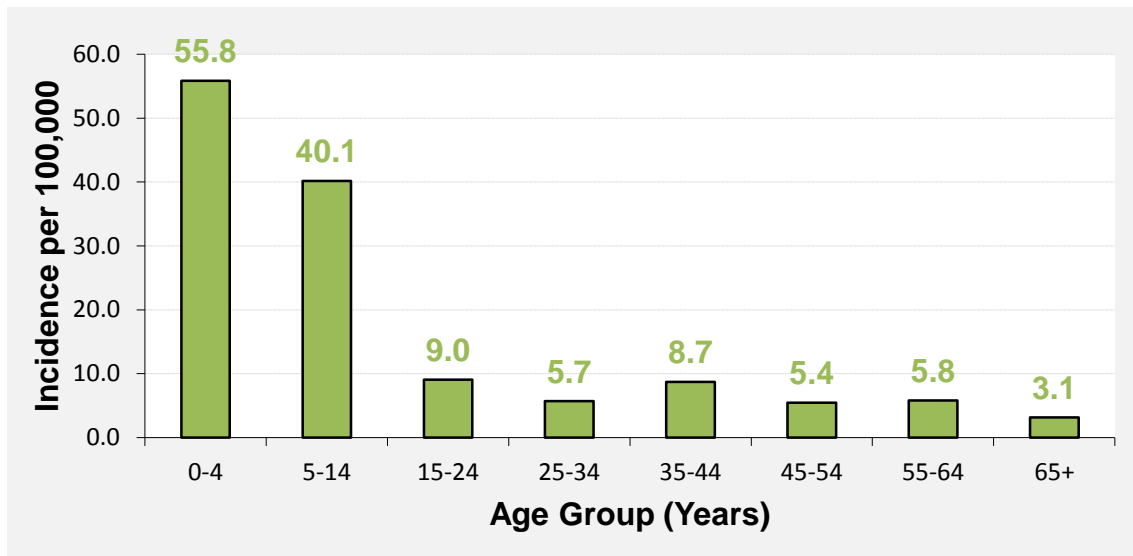


** Kansas incidence includes confirmed and probable cases*

Pertussis incidence per 100,000 population, Kansas, 2014



Pertussis incidence per 100,000 population Kansas, 2014



Pertussis cases per month Kansas, 2014

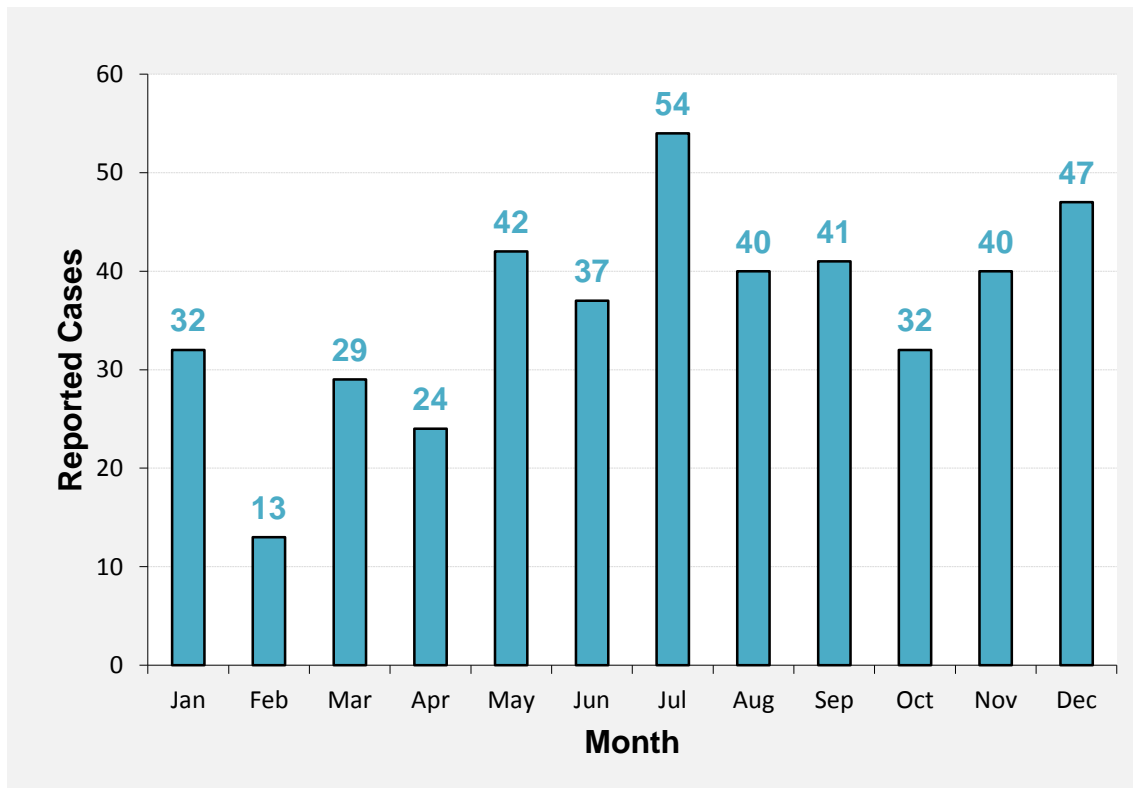
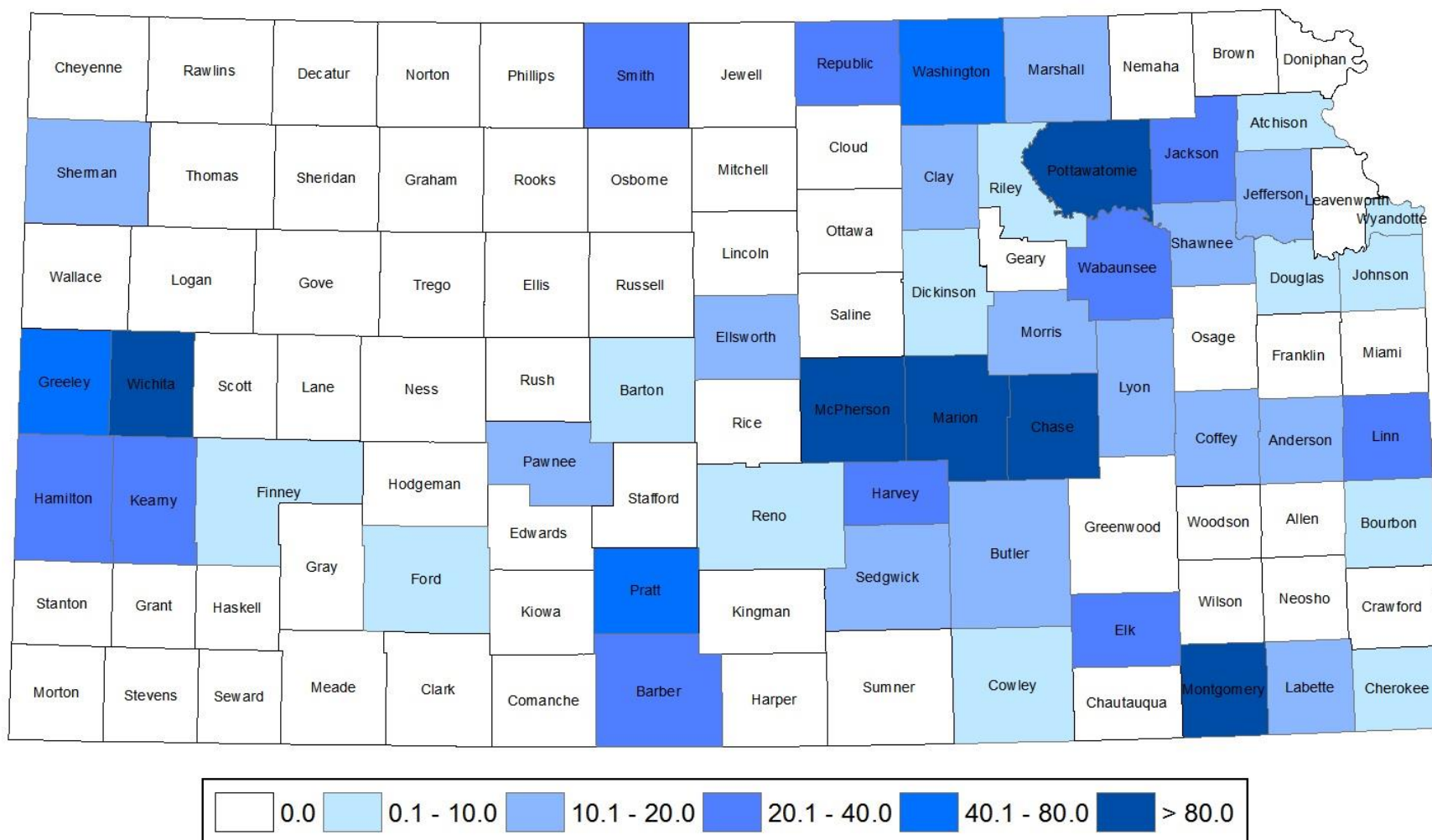


Figure 1: Incidence of pertussis per 100,000 population by county, Kansas, 2014



Q FEVER

CLINICAL FEATURES: The onset may be sudden with chills, retrobulbar headache, weakness, malaise and severe sweats. There is considerable variation in the severity and duration of symptoms; however, acute Q fever usually lasts 1 to 4 weeks. Infections may be inapparent or present as "fever of unknown origin". A pneumonitis is found on x-ray in some cases but without the cough, chest pain, sputum production, or physical findings typical of most pneumonias. Elevated liver enzymes are common and complications can include acute and chronic granulomatous hepatitis. Chronic Q fever can manifest as endocarditis with a prolonged course lasting for years and lead to the destruction of native heart valves necessitating valve replacement. Rare clinical syndromes, including neurologic complications, have been described.

CAUSATIVE AGENT: *Coxiella burnetii*, an intracellular, rickettsial bacterium

MODE OF TRANSMISSION: The most common reservoirs are domestic farm animals, especially sheep, goats, and cows. Cats, dogs, rodents, marsupials, other mammalian species, and some wild and domestic bird species may also transmit infection to humans. Tick vectors may be important for maintaining animal and bird reservoirs, but are not thought to be important in transmission to humans. Humans typically acquire infection by inhalation of *C. burnetii* in fine-particle aerosols generated from birthing fluids during animal parturition or through inhalation of dust contaminated by these materials.

INCUBATION PERIOD: Can vary from 9 to 39 days but is usually 14 to 22 days.

PERIOD OF COMMUNICABILITY: Direct transmission from person to person rarely if ever occurs. However, contaminated clothing may be a source of infection.

PUBLIC HEALTH SIGNIFICANCE: The organism responsible for Q fever is a potential bioterrorist agent. Special safety practices are recommended for laboratory procedures and research facilities involving *Coxiella burnetii*. Strict adherence to proper hygiene when handling parturient animals can help decrease the risk of infection in the farm setting.

REPORTABLE DISEASE IN KANSAS SINCE: 2000

EPIDEMIOLOGY AND TRENDS

Confirmed and Probable Cases: 2

Kansas incidence per 100,000 population (2014): 0.07

U.S. incidence per 100,000 population (2013): 0.05

Two probable cases of acute Q were reported in Kansas during 2014; there were no confirmed or chronic cases. Since 2008, zero to four cases have been reported annually. Exposure risks were available for both cases. One acute case reported exposure to cattle, cats and goats within Kansas, while the other case reported international travel with exposure to goats.

RABIES, ANIMAL

CLINICAL FEATURES: Rabies virus infects the central nervous system causing encephalopathy and death. This infection can cause a variety of clinical signs in animals. Often people will refer to “furious” rabies or “dumb” rabies. Animals with encephalitic, or furious, rabies are very aggressive and will often bite objects, other animals, or people. Animals with paralytic, or dumb, rabies may be timid and shy. They often reject food and water due to paralysis of the lower jaw and muscles. Signs of animal rabies include: changes in behavior, general sickness, problems swallowing, an increase in saliva (e.g. foaming at the mouth), wild animals appearing abnormally tame or sick, animals that bite at everything if excited, difficulty moving or paralysis and, death.

CAUSATIVE AGENT: Lyssavirus

MODE OF TRANSMISSION: Wild mammals are the most important source of infection for both humans and animals in the United States. Skunks are the main reservoir for rabies in Kansas and rabies is considered endemic in all Kansas counties. Transmission occurs through bite and non-bite exposures. Bite exposures occur when the skin is punctured by teeth; virus particles may reach a nerve and cause infection. A non-bite exposure occurs when an open wound, scratch, abrasion, or intact mucous membrane (e.g. inside of mouth, eyelids) is contaminated with the saliva, brain material, or cerebrospinal fluid from a rabid animal; a scratch from a rabid animal is also considered a non-bite exposure.

INCUBATION PERIOD: In animals, generally 15-50 days, but variable and in rare cases even several months or longer.

PERIOD OF COMMUNICABILITY: In dogs, cats, and ferrets, rabies is communicable 10 days before the onset of clinical signs, and throughout the illness until death. The period of communicability in other species is unknown.

PUBLIC HEALTH SIGNIFICANCE: Rabies infection in both animals and people is fatal. People that have been bitten by a known or suspected rabid animal should receive rabies post-exposure prophylaxis (PEP) as soon as possible. Investigation of confirmed animal rabies cases and unsuitable rabies specimens represents a significant burden for local health departments in Kansas. Public health officials conduct an exposure risk assessment for each human contact to provide recommendations for PEP and for each animal contact to determine the need for observation or quarantine.

REPORTABLE DISEASE IN KANSAS SINCE: 1982

LABORATORY CRITERIA FOR SURVEILLANCE PURPOSES

- Positive direct fluorescent antibody test (preferably performed on central nervous system tissue), **OR**
- Isolation of rabies virus in cell culture or in a laboratory animal

SURVEILLANCE CASE DEFINITIONS

- *Confirmed*: a case that is laboratory confirmed.

EPIDEMIOLOGY AND TRENDS

Confirmed Cases: 70

In Kansas, 70 laboratory-confirmed cases of rabies in animals were reported in 34 different counties during 2014 (Figure 1). The three-year median for 2011-2013 was 56 cases. Confirmed cases per year may not represent an actual change in rabies prevalence, but rather a change in the number of animal-to-animal or animal-to-human exposures. In Kansas, animals are not usually tested unless an exposure has occurred.

In 2014, 6.1% of all animal submissions tested positive for rabies; the three-year median for 2011-2013 was 4.4%. Among animals that were commonly tested (i.e., cats, dogs, cows, bats, raccoons, skunks), skunks tested positive most frequently (Table 1). The number of animals submitted for testing and the number of rabies-positive animals tend to follow the cyclical pattern of the skunk population in the state.

Figure 1: Number of rabies-positive animal species by county, Kansas, 2014

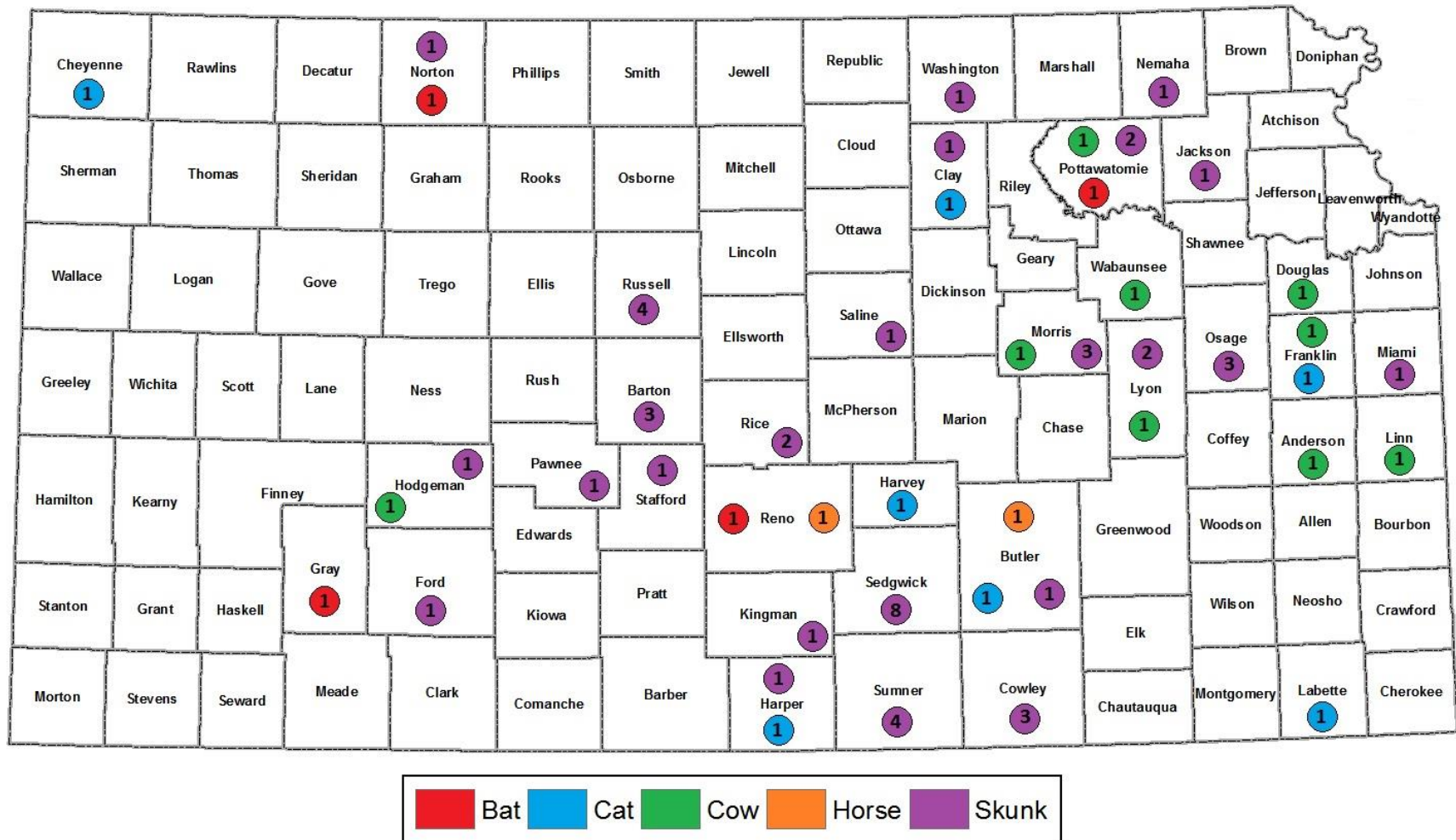


Table 1: Animal rabies testing by species, Kansas, 2014

	Species	# Tested	# Positive	% Positive
Domestic	Cat	396	7	2%
	Cow	69	9	13%
	Dog	312	0	0%
	Donkey	2	0	0%
	Ferret	1	0	0%
	Goat	1	0	0%
	Horse	15	2	13%
	Pig	3	0	0%
	Rabbit	1	0	0%
	Sheep	1	0	0%
Wildlife	Bat	177	4	2%
	Buffalo	1	0	0%
	Coyote	3	0	0%
	Deer	1	0	0%
	Fox	4	0	0%
	Gopher	3	0	0%
	Ground hog	2	0	0%
	Lemur	1	0	0%
	Mink	1	0	0%
	Mouse/Rat	8	0	0%
	Muskrat	1	0	0%
	Opossum	11	0	0%
	Raccoon	32	0	0%
	Skunk	85	48	56%
	Squirrel	12	0	0%

The state's predominant rabies virus variant, the "south central skunk" variant, was found in all of the positive rabies terrestrial animals that were typed in Kansas during 2014.

Bats have been associated with most of the human cases in the United States. Four of the 177 bats submitted for testing in Kansas were positive for rabies during 2014; three were big brown bats (*Eptesicus fuscus*) and one hoary bat (*Lasiurus cinereus*).

Public health officials are required to identify all potential contacts (animal and human) of each rabid animal, which entails extensive investigation of each case. Thirty-nine of 70 rabid animals had at least one animal contact; 87 animal contacts were identified. Twenty-three of the 70 rabid animals had at least one human contact; 51 human contacts were identified. Of those people with reported exposure to confirmed rabid animals, 26 were recommended PEP by public health officials; however, 35 people received PEP (Table 2).

Table 2: PEP receipt of contacts to rabies-positive animals, Kansas, 2014

Species	# of Positive Cases with Human Contact	# of Contacts Recommended PEP	# of Contacts Received PEP
Bat	8	3	3
Cat	10	9	10
Cow	17	10	14
Horse	8	2	5
Skunk	8	2	3

There were no human rabies cases in Kansas in 2014; the last reported human rabies case in Kansas was in 1968.

SALMONELLOSIS

(non-typhoidal)

CLINICAL FEATURES: Acute gastroenteritis with sudden onset of fever, headache, diarrhea, abdominal pain, nausea, and sometimes vomiting. Dehydration may be severe. Asymptomatic infections and extraintestinal infections can occur. Children younger than 4 years of age, elderly individuals, and persons with immunosuppressive conditions may experience severe complications, including invasive infection and mortality.

CAUSATIVE AGENT: *Salmonella enterica* subsp. *enterica* serovars, gram-negative bacteria (~2,000 serotypes cause human infection)

MODE OF TRANSMISSION: Naturally found in a wide range of domestic and wild animals, such as poultry, livestock, reptiles, and pets. Transmission occurs by ingestion of organisms in water or food contaminated by feces of an infected animal or person or food derived from infected animals. Handling raw meat or poultry products, or contact with infected reptiles or live poultry, can also result in transmission.

INCUBATION PERIOD: 6-72 hours, usually 12-36 hours.

PERIOD OF COMMUNICABILITY: Extremely variable, usually several days to several weeks dependent upon the course of infection. A carrier state can continue for over 1 year in 1% of adults and 5% of children under 5 years of age, especially infants. Prolonged, asymptomatic fecal shedding can promote person-to-person transmission.

PUBLIC HEALTH SIGNIFICANCE: Disease can be prevented by promotion of good hand washing and food handling practices. Symptomatic food handlers should be excluded from normal duties. Outbreak situations should be examined for a common vehicle of transmission. Situations in which control cannot be established may require exclusion of infected persons from daycare, patient care, or food handling.

REPORTABLE DISEASE IN KANSAS SINCE: 1982

LABORATORY CRITERIA FOR SURVEILLANCE PURPOSES

- Isolation of *Salmonella* from a clinical specimen.

SURVEILLANCE CASE DEFINITIONS

- *Confirmed:* A case that is laboratory confirmed.
- *Probable:* A clinically compatible case that is epidemiologically linked to a confirmed case.

EPIDEMIOLOGY AND TRENDS

In 2014, 428 cases (424 confirmed and 4 probable) of salmonellosis were reported in Kansas. The three-year median for 2011-2013 was 444 cases. Cases ranged in age from less than 1 year to 101 years; the median age was 28 years. Though salmonellosis occurred in persons of all age groups, it was most frequently reported among those less than 5 years of age (21% of cases, 45.36 per 100,000 population). 133 cases (31%) were hospitalized and no deaths were reported. 10 (2%) cases were outbreak-associated.

Complete serotype information was available for 362 (85%) of the confirmed cases.

Most common *Salmonella* serotypes, Kansas, 2014

Salmonella Serotype	Number of Confirmed	% of Total Confirmed
	Cases	Cases
Enteritidis	74	17.3
Typhimurium	69	16.1
Newport	56	13.1
I 4,[5],12:i:-	27	6.3
Heidelberg	17	3.9
Thompson	15	3.5
Infantis	12	2.8
Braenderup	10	2.3
Oranienburg	9	2.1
Muenchen	7	1.6
Saintpaul	7	1.6
Montevideo	6	1.4
Other/Unknown	119	27.8

Specimen sources for *Salmonella* isolates, Kansas, 2014

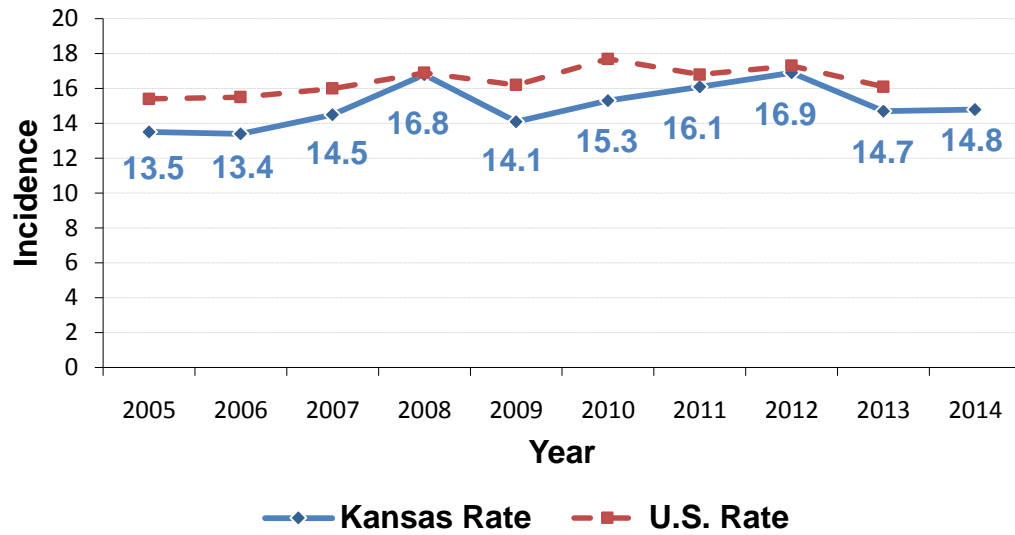
Specimen Source	Number of Confirmed	% of Total Confirmed
	Cases	Cases
Stool	349	83.1
Urine	50	11.9
Blood	15	3.6
Other/Unknown	14	3.3

Confirmed and Probable Cases: 428

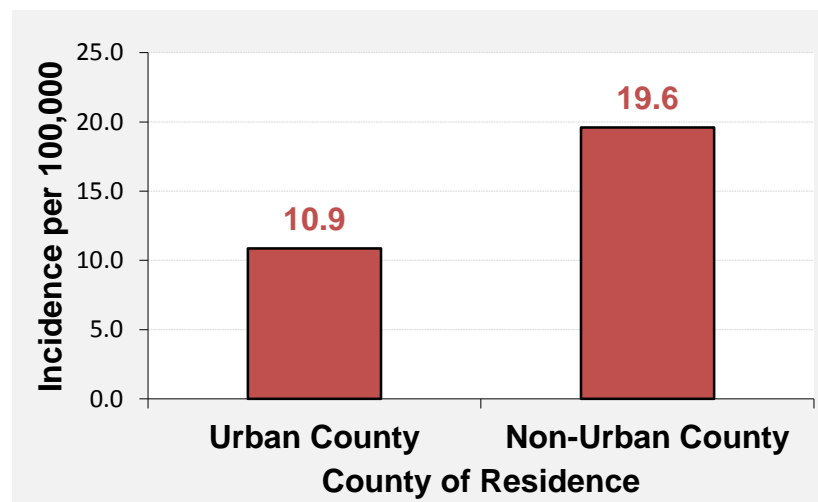
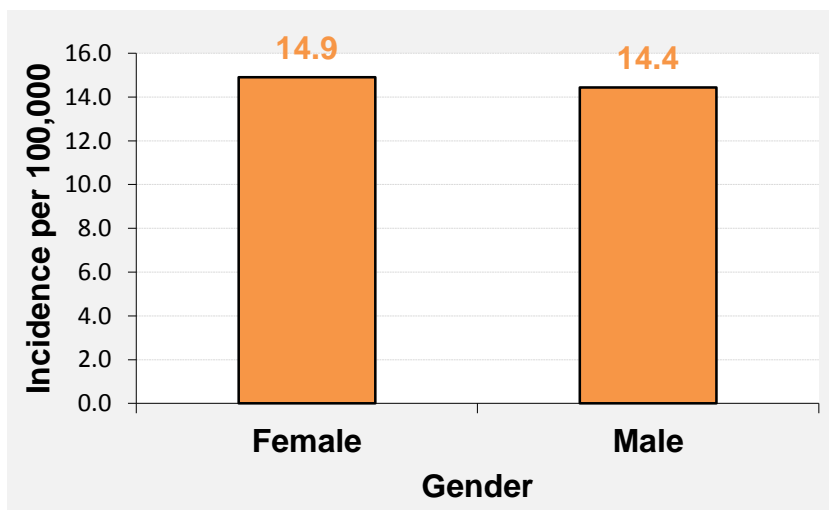
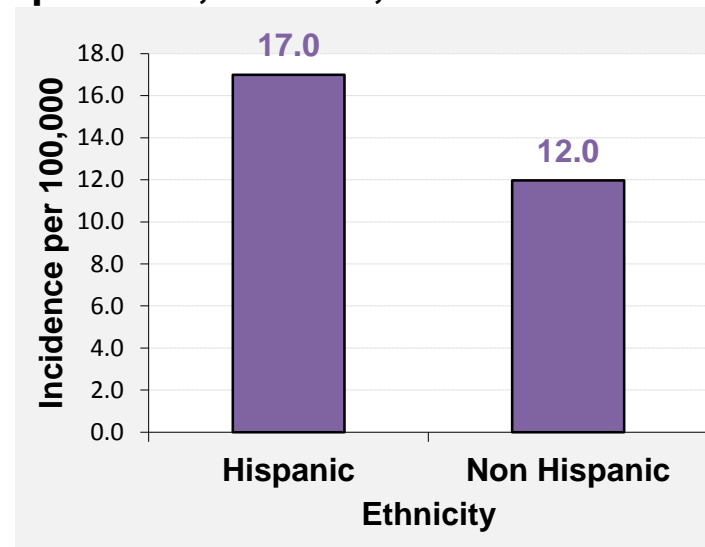
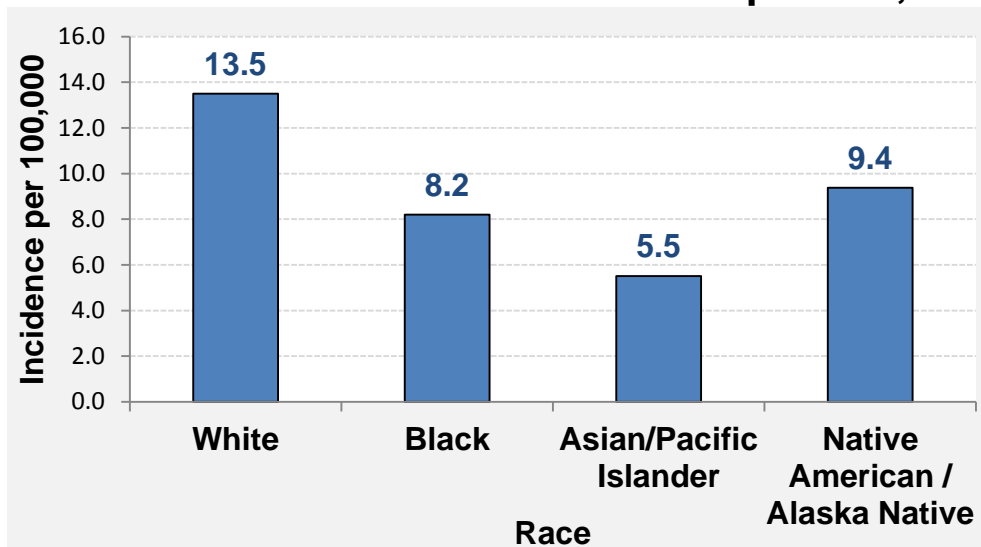
Kansas incidence per 100,000 population (2014): 14.79

U.S. incidence per 100,000 population (2013): 16.13

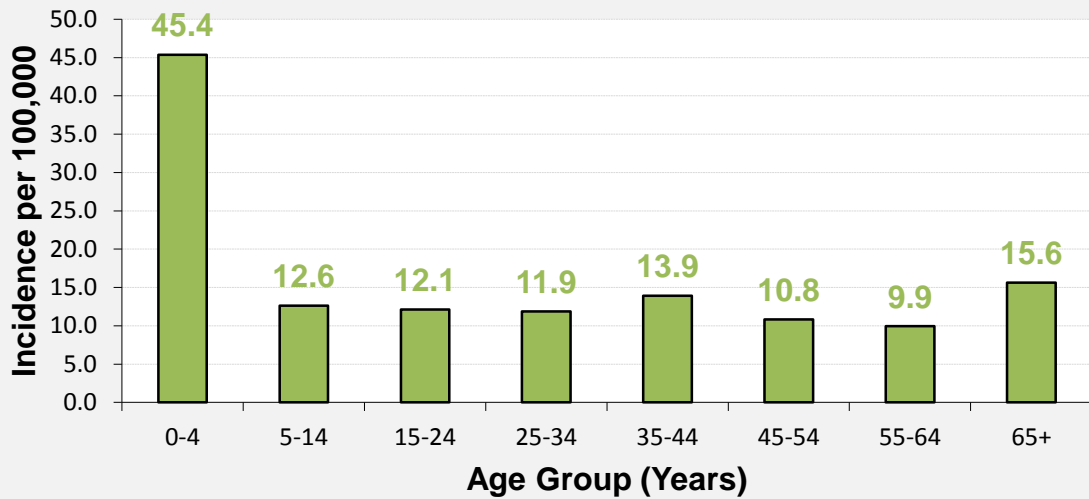
**Salmonellosis incidence per 100,000 population by year,
2005 - 2014**



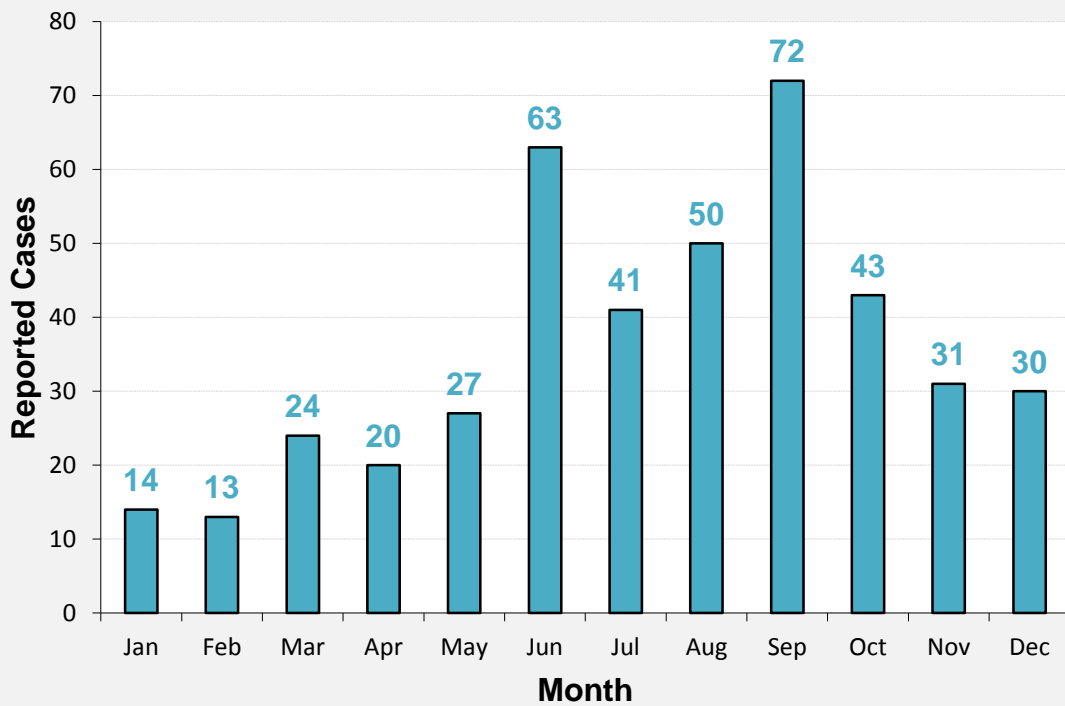
Salmonellosis incidence per 100,000 population, Kansas, 2014



Salmonellosis incidence per 100,000 population Kansas, 2014



Salmonella cases per month Kansas, 2014



SHIGA TOXIN-PRODUCING *ESCHERICHIA COLI*

CLINICAL FEATURES: Most strains of *E. coli* are harmless and live in the intestines of healthy humans and animals; other strains may cause disease in humans. The most virulent of these strains is Shiga toxin-producing *E. coli* (STEC), formally known as enterohemorrhagic *E. coli* (EHEC). *E. coli* O157:H7 is the predominant STEC serotype. Illness due to STEC is usually self-limiting and consists of severe abdominal cramping and bloody diarrhea. Serious clinical manifestations, including hemolytic-uremic syndrome (HUS), a complication that alters normal kidney function; and postdiarrheal thrombotic thrombocytopenic purpura (TTP), a blood and kidney illness that affects the nervous system, may occur, particularly among immunocompromised individuals, young children, and the elderly.

To reduce the likelihood of HUS development, persons with suspected STEC infection should not be treated with beta-lactam antibiotics. Evidence suggests that all antimicrobial therapy should be avoided in persons who may have STEC, particularly in those under 5 years of age.

CAUSATIVE AGENT: *E. coli* consists of a diverse group of bacteria. Pathogenic (illness-causing) *E. coli* strains are categorized into pathotypes. Six pathotypes are associated with diarrhea and collectively are referred to as diarrheagenic *E. coli*. These include Shiga toxin-producing *E. coli* (STEC), enterotoxigenic *E. coli* (ETEC), enteropathogenic *E. coli* (EPEC), enteroaggregative *E. coli* (EAEC), enteroinvasive *E. coli* (EIEC), and diffusely adherent *E. coli* (DAEC). Only STEC is a reportable disease in Kansas.

MODE OF TRANSMISSION: Transmission of STEC strains occurs via the fecal-oral route, during which susceptible individuals ingest food or liquids contaminated with human or animal feces. Outbreaks of STEC infections have been linked to eating undercooked ground beef, consuming contaminated produce, and drinking contaminated water or unpasteurized juice. Person-to-person transmission can occur, especially within daycare settings and nursing homes. Zoonotic transmission of STEC can also occur, particularly from cows and goats, and outbreaks have been linked to petting zoos.

INCUBATION PERIOD: May range from 1 to 10 days (usually 3-4 days).

PERIOD OF COMMUNICABILITY: The bacteria typically disappears from the feces by the time the illness is resolved, but may be shed for several weeks, even after symptoms go away. Young children tend to carry STEC longer than adults. A few people keep shedding these bacteria for several months.

PUBLIC HEALTH SIGNIFICANCE: Diarrhea-causing *E. coli* is often associated with contaminated beef and food products. Monitoring this disease serves as a potential indicator to problems in meat, fruit, and/or vegetable processing. A product recall may be issued if *E. coli* O157:H7 contamination is suspected—the USDA enforces a "zero tolerance" policy on this pathogen. Outbreaks associated with daycares and petting zoos are of significance due to the increased likelihood of HUS development in children infected with STEC.

REPORTABLE DISEASE IN KANSAS SINCE: 1997

LABORATORY CRITERIA FOR SURVEILLANCE PURPOSES

- Laboratory confirmed:
 - Isolation of STEC from a clinical specimen. *Escherichia coli* O157 isolates that produce the H7 antigen may be assumed to be Shiga toxin-producing. For all other *E. coli* isolates, Shiga toxin production or the presence of Shiga toxin genes must be determined to be considered STEC.
 - Both asymptomatic infections and infections at sites other than the gastrointestinal tract, if laboratory confirmed, are considered confirmed cases that should be reported.
- Supportive laboratory results:
 - A case with isolation of *E. coli* O157 from a clinical specimen, without confirmation of H antigen or Shiga toxin production
 - Identification of an elevated antibody titer to a known STEC serotype from a clinically compatible case
 - Identification of Shiga toxin in a specimen from a clinically compatible case without the isolation of STEC

SURVEILLANCE CASE DEFINITIONS

- *Suspect*:
 - A case of postdiarrheal HUS or TTP, **OR**
 - Identification of Shiga toxin in a specimen from a clinically compatible case without the isolation of the Shiga toxin-producing *E. coli*.
- *Probable*:
 - A case with isolation of *E. coli* O157 from a clinical specimen, without confirmation of H antigen or Shiga toxin production, **OR**
 - A clinically compatible case who is a contact of an STEC case or is a member of a defined risk group during an outbreak, **OR**
 - Identification of an elevated antibody titer to a known Shiga toxin-producing *E. coli* serotype from a clinically compatible case.
- *Confirmed*: A case that meets the laboratory criteria for diagnosis.

EPIDEMIOLOGY AND TRENDS

Of the 90 confirmed and probable cases of Shiga toxin-producing *Escherichia coli* reported in Kansas during 2014, 40 (44%) were caused by *E. coli* O157.

Shiga toxin-producing *E. coli* cases by serotype, Kansas, 2014

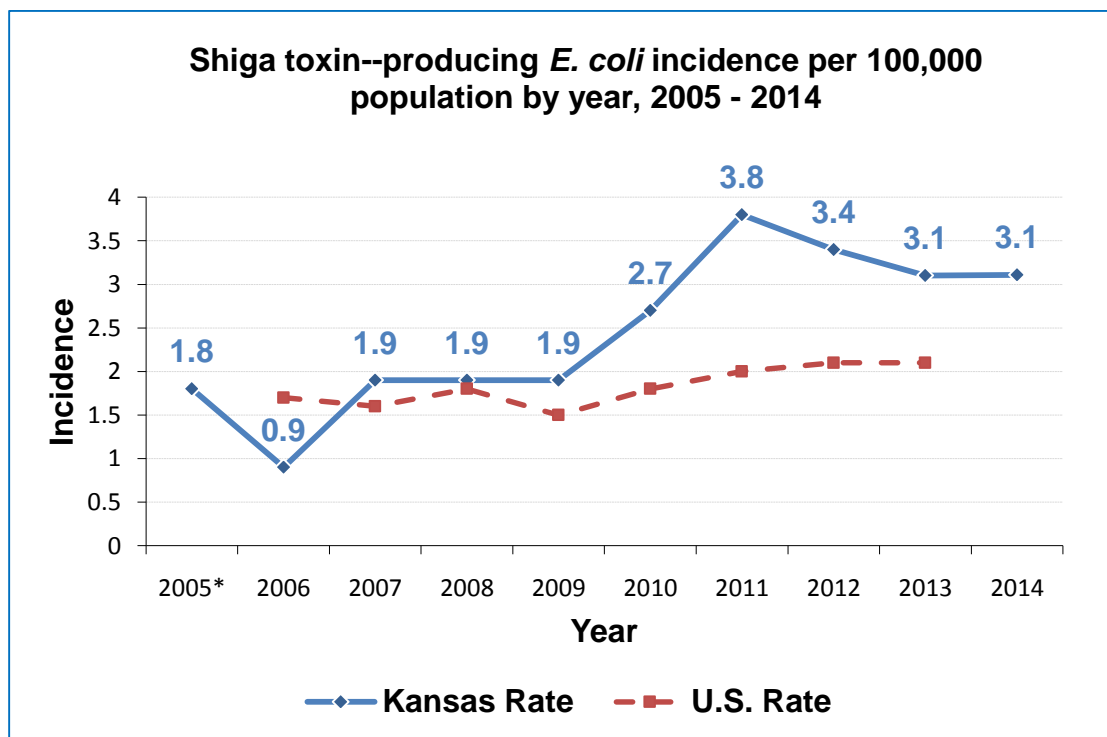
Serotype	Number of Cases
O157	40
O26	15
O103	9
O111	5
O145	4
O174	1
Unknown	16

Kansas's three-year median for 2011-2013 was 97 cases. The highest rate of disease (12.46 per 100,000) was reported among children aged fewer than five years. Nine (10%) of the 90 cases progressed to postdiarrheal hemolytic uremic syndrome (HUS).

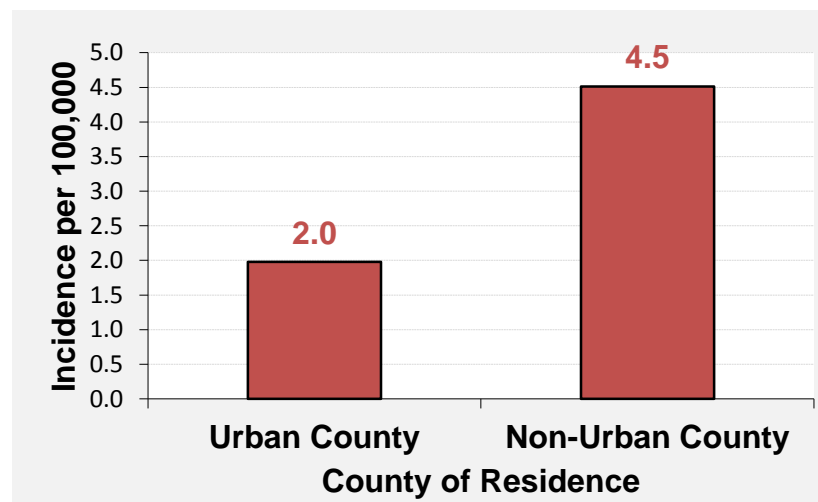
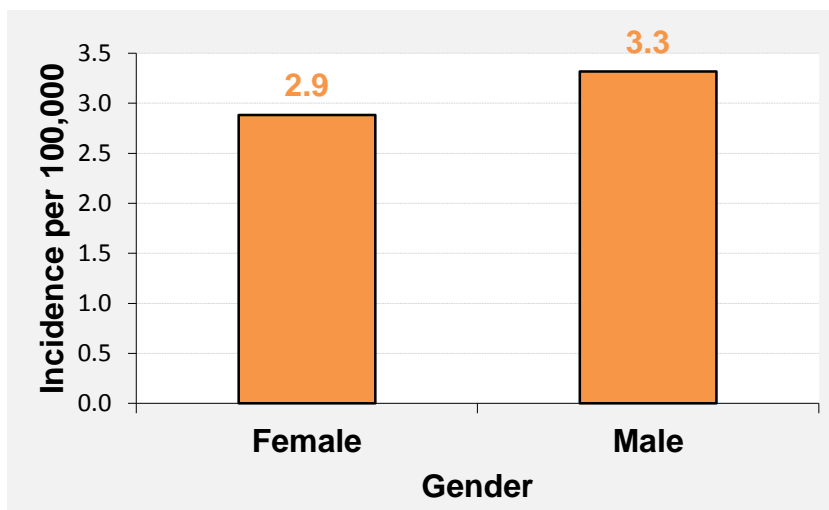
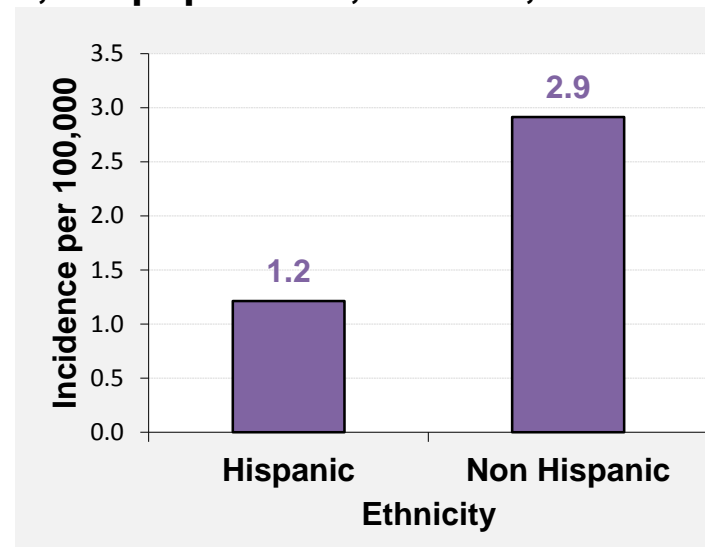
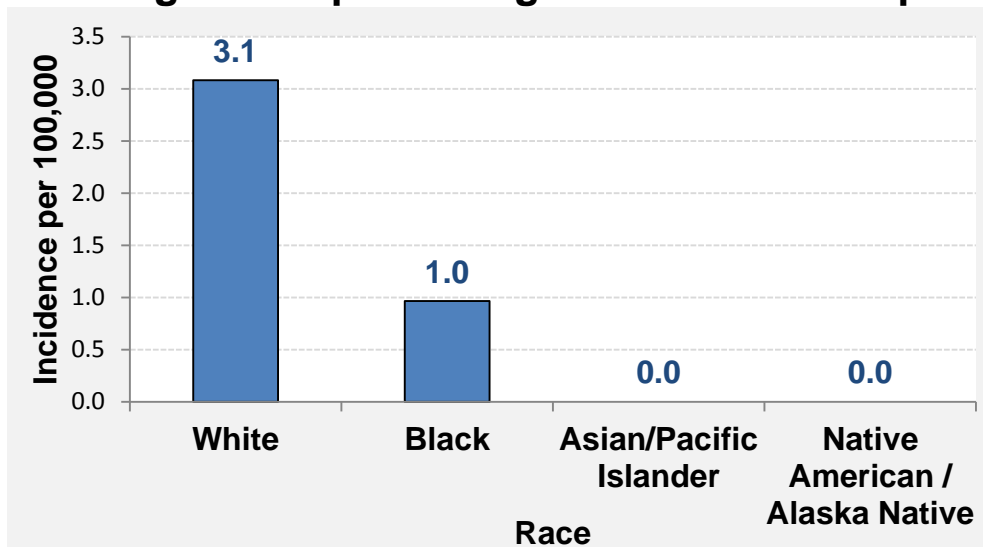
Confirmed and Probable Cases: 90

Kansas incidence per 100,000 population (2014): 3.11

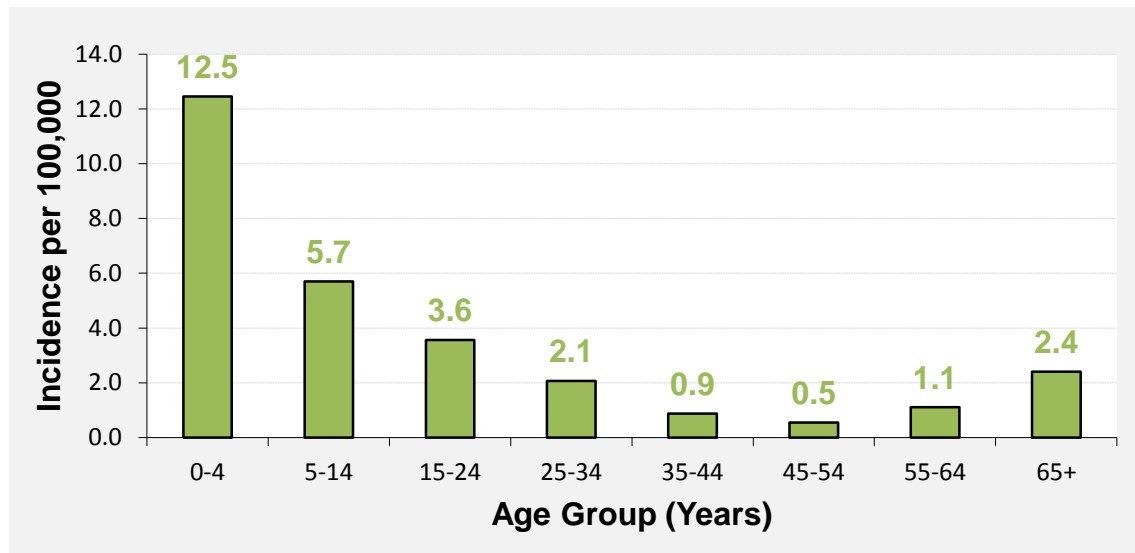
U.S. incidence per 100,000 population (2013): 2.13



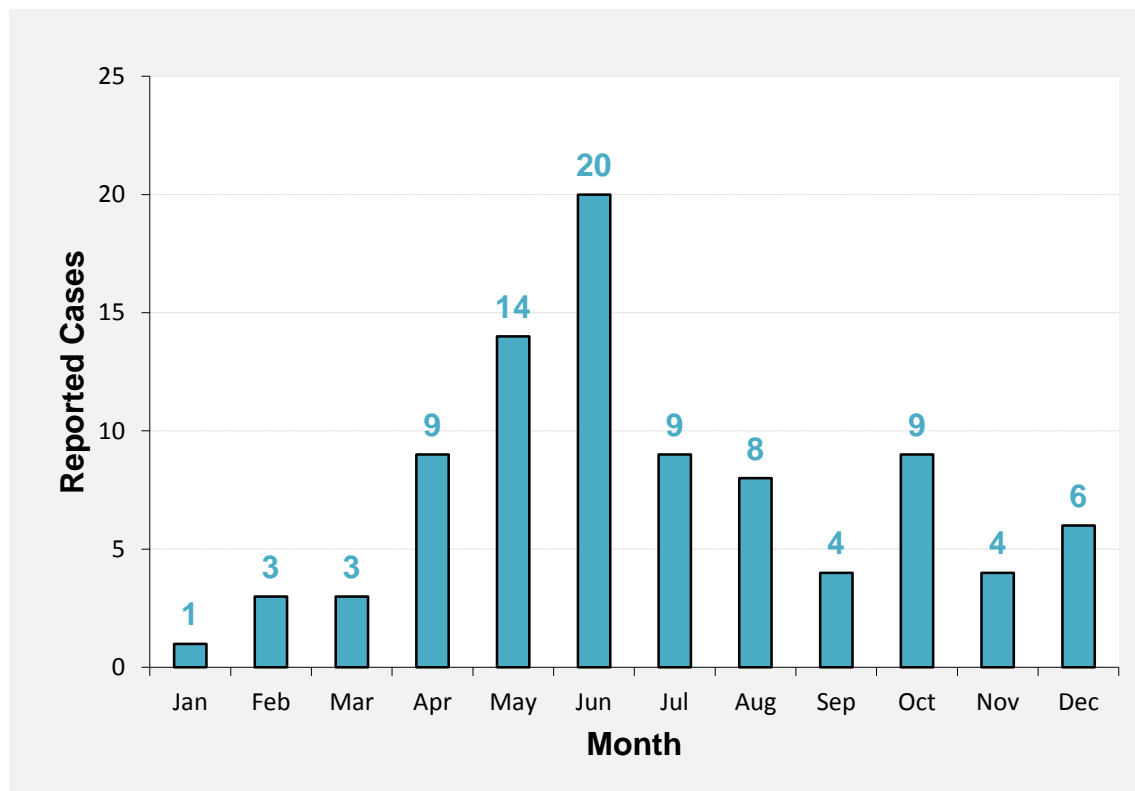
Shiga toxin-producing *E. coli* incidence per 100,000 population, Kansas, 2014



Shiga toxin-producing *E. coli* incidence per 100,000 population, Kansas, 2014



Shiga toxin-producing *E. coli* cases per month Kansas, 2014



SHIGELLOSIS

CLINICAL FEATURES: Illness of variable severity characterized by diarrhea, fever, nausea, cramps, and tenesmus. Asymptomatic infections may occur.

CAUSATIVE AGENT: *Shigella* spp., a gram-negative bacterium, including *S. flexneri*, *S. sonnei*, *S. boydii*, and *S. dysenteriae*.

MODE OF TRANSMISSION: Primarily spread through fecal-oral transmission through direct or indirect contact. May also be spread through water or milk by direct fecal contamination. Humans are the natural host for *Shigella*.

INCUBATION PERIOD: Ranges from 12 hours to 7 days (average 2 to 4 days).

PERIOD OF COMMUNICABILITY: During the acute illness until the organism is no longer present in feces. Organism will usually clear within 4 weeks of illness onset, although in rare cases it may persist for months.

PUBLIC HEALTH SIGNIFICANCE: Disease may be prevented by promotion of good hand washing. Outbreaks are common among homosexual men, in conditions of overcrowding, and in day care and institutional settings; exclusion policies may apply in some outbreak situations.

REPORTABLE DISEASE IN KANSAS SINCE: 1982

LABORATORY CRITERIA FOR SURVEILLANCE PURPOSES

- Isolation of *Shigella* spp. from a clinical specimen.

SURVEILLANCE CASE DEFINITIONS

- *Confirmed:* A case that is laboratory confirmed.
- *Probable:* A clinically compatible case that is epidemiologically linked to a confirmed case.

EPIDEMIOLOGY AND TRENDS

In 2014, 55 confirmed and probable cases of shigellosis were reported in Kansas. The three-year median for 2011-2013 was 53.5 cases.

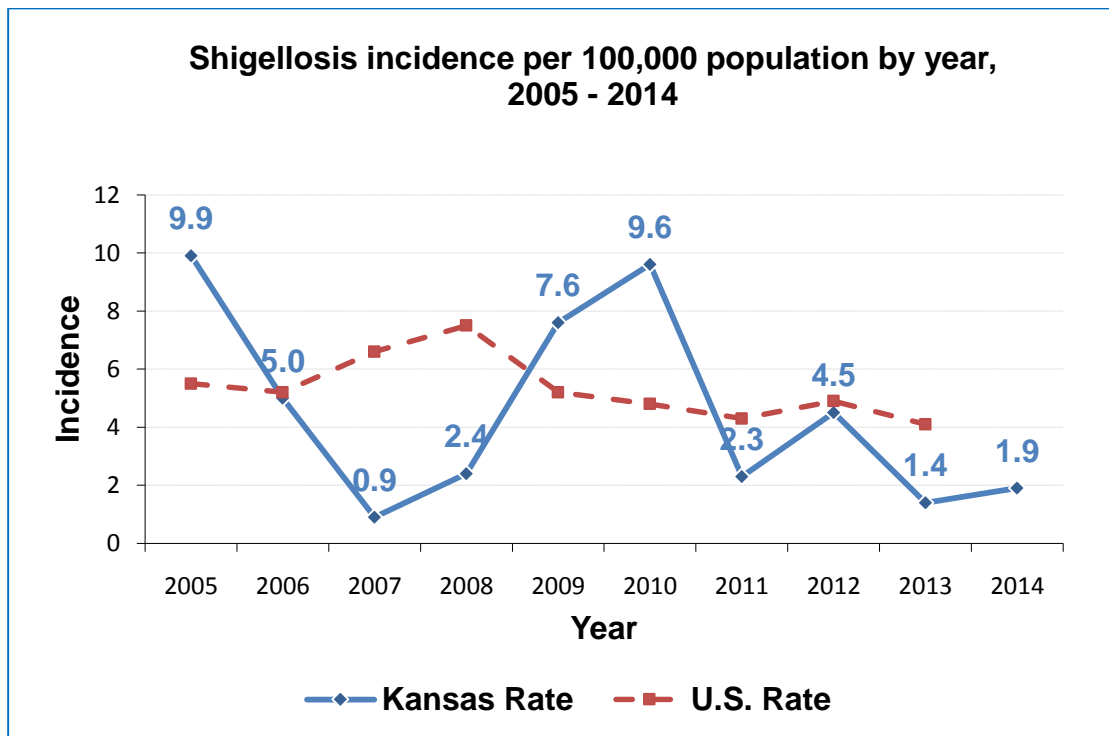
Cases ranged in age from one year to 67 years. The median age was eighteen years. Almost one-half (44%) of the cases occurred among children less than 15 years of age; the highest incidence rate occurred in those zero to five years of age (4.98 per 100,000).

The species of *Shigella* was reported for 35 (64%) of the 55 total cases; of these, 28 (65%) were identified as *S. sonnei* and 7 (16%) were *S. flexneri*.

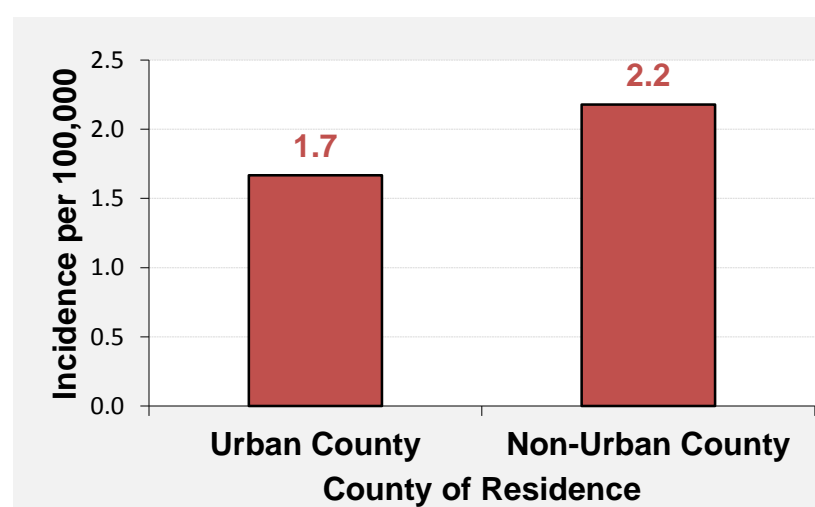
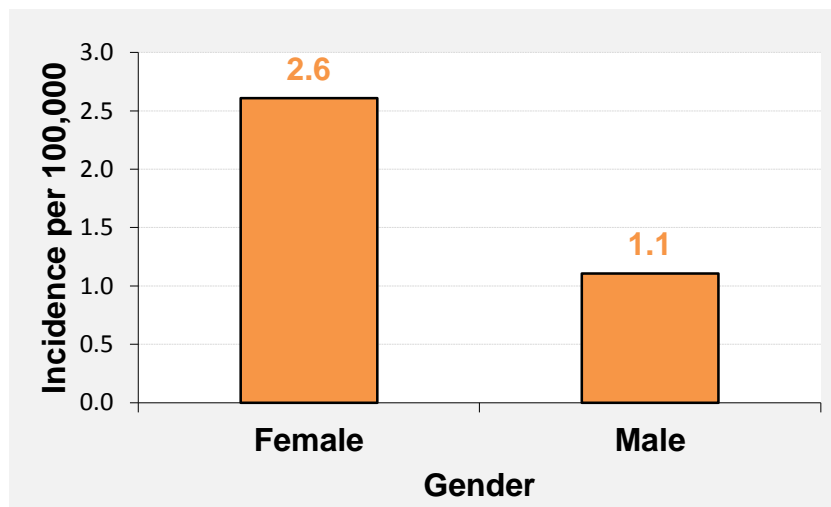
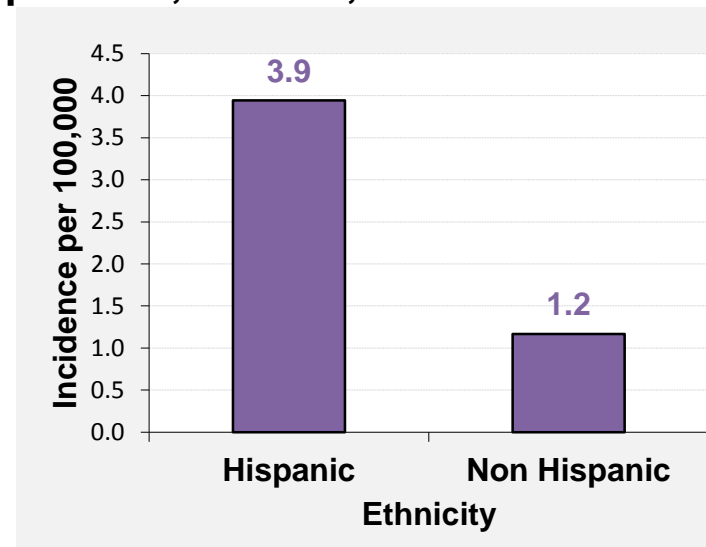
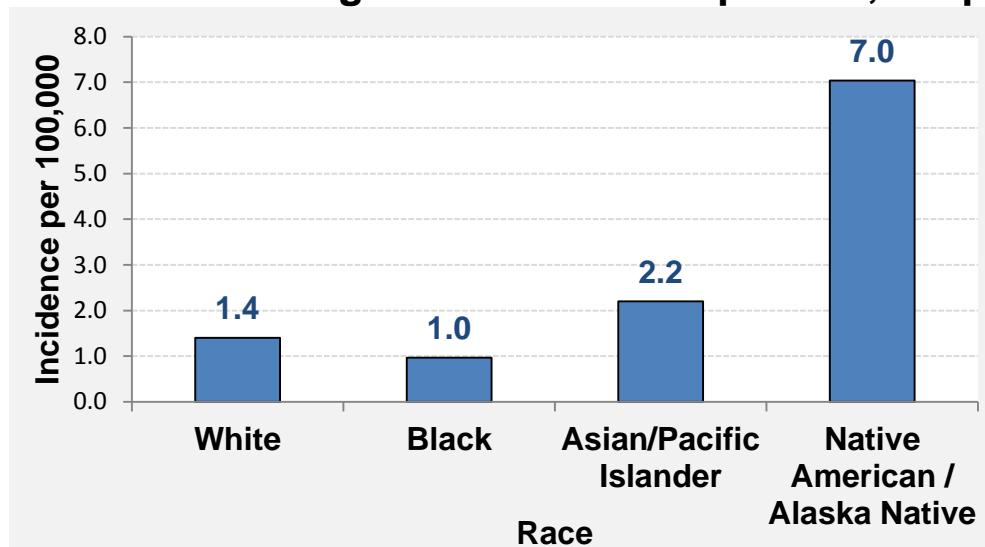
Confirmed and Probable Cases: 55

Kansas incidence per 100,000 population (2014): 1.90

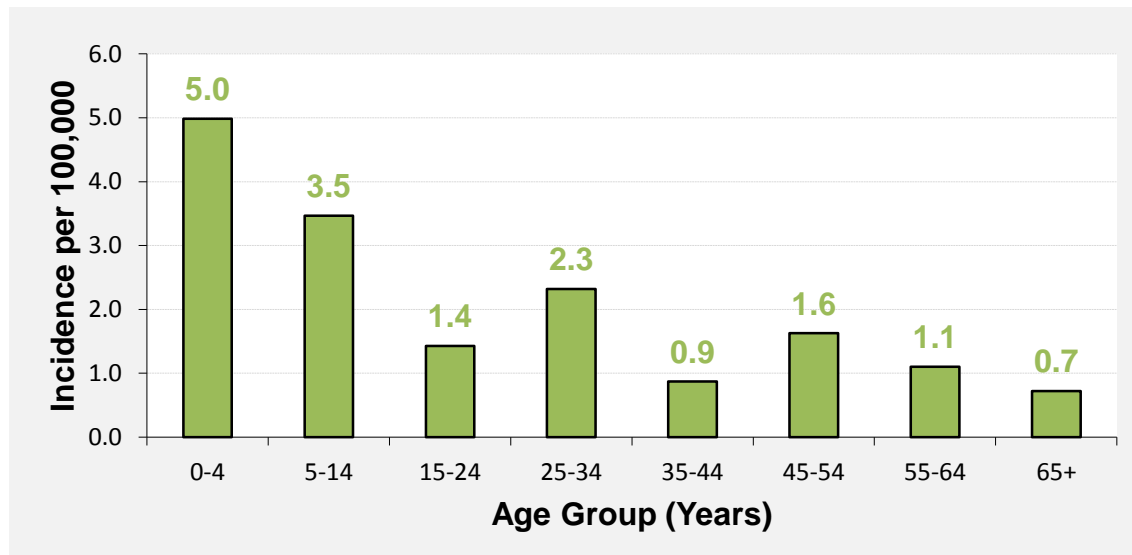
U.S. incidence per 100,000 population (2013): 4.06



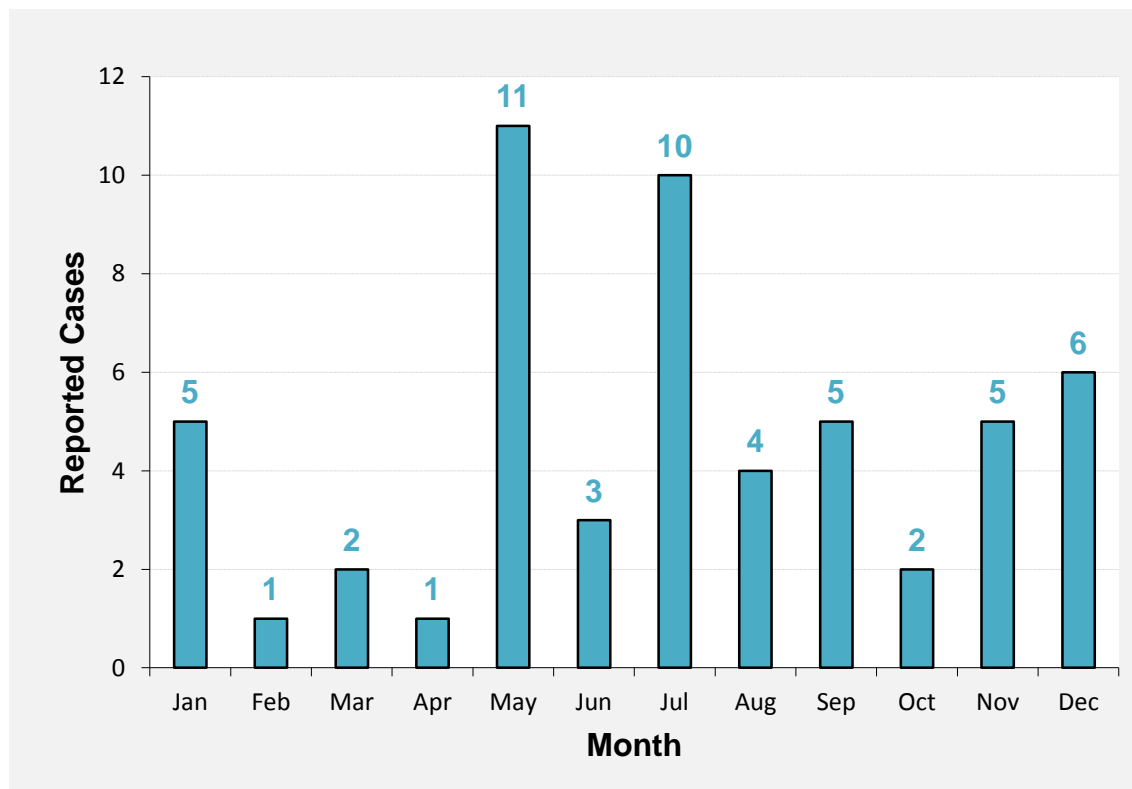
Shigellosis incidence per 100,000 population, Kansas, 2014



Shigellosis incidence per 100,000 population, Kansas, 2014



Shigellosis cases per month Kansas, 2014



SPOTTED FEVER RICKETTSIOSIS

CLINICAL FEATURES: All rickettsioses cause fever, rash, and vasculitis. In the case of Rocky Mountain spotted fever, cases initially present with sudden onset of moderate to high fever, malaise, deep muscle pain, severe headache, chills, and loss of appetite. A rash will appear 2 – 5 days after the onset of fever, and may be accompanied by abdominal pain, joint pain, and diarrhea. The characteristic rash will typically begin on the extremities, including the palms of the hands and soles of the feet, and may spread rapidly to the rest of the body

CAUSATIVE AGENT: *Rickettsia* spp. *Rickettsia rickettsii* causes Rocky Mountain spotted fever, which is maintained in nature during the complete life cycle of ticks and can be transmitted to dogs, rodents, and other animals.

MODE OF TRANSMISSION: Through the bite of an infected tick, or by contamination of broken skin by infected tick feces or blood. Typically, at least 4-6 hours of attachment is required for the *Rickettsiae* to reactivate and become infectious to humans.

INCUBATION PERIOD: From 3 days to about 14 days for Rocky Mountain spotted fever.

PERIOD OF COMMUNICABILITY: None, there is no direct transmission from person-to-person. Ticks remain infectious for their entire life, as long as 18 months.

PUBLIC HEALTH SIGNIFICANCE: Disease may be prevented through personal protective measures against ticks. No vaccine is currently licensed in the US. Case fatality rate for untreated cases is between 13% and 25%; death is uncommon in cases with prompt recognition and treatment.

REPORTABLE DISEASE IN KANSAS SINCE: 1982

EPIDEMIOLOGY AND TRENDS

In 2014, 110 probable cases of spotted fever rickettsiosis were reported in Kansas. (No confirmed cases were reported.) Thirty (27%) cases were hospitalized. No deaths were reported. Cases ranged in age from three to 87 years, with a median age of 50.5 years. Seventy-eight (71%) cases were male. Among cases with known race (n=107), 103 (96%) were white, and among cases with known ethnicity (n=103), 101 were (98%) non-Hispanic.

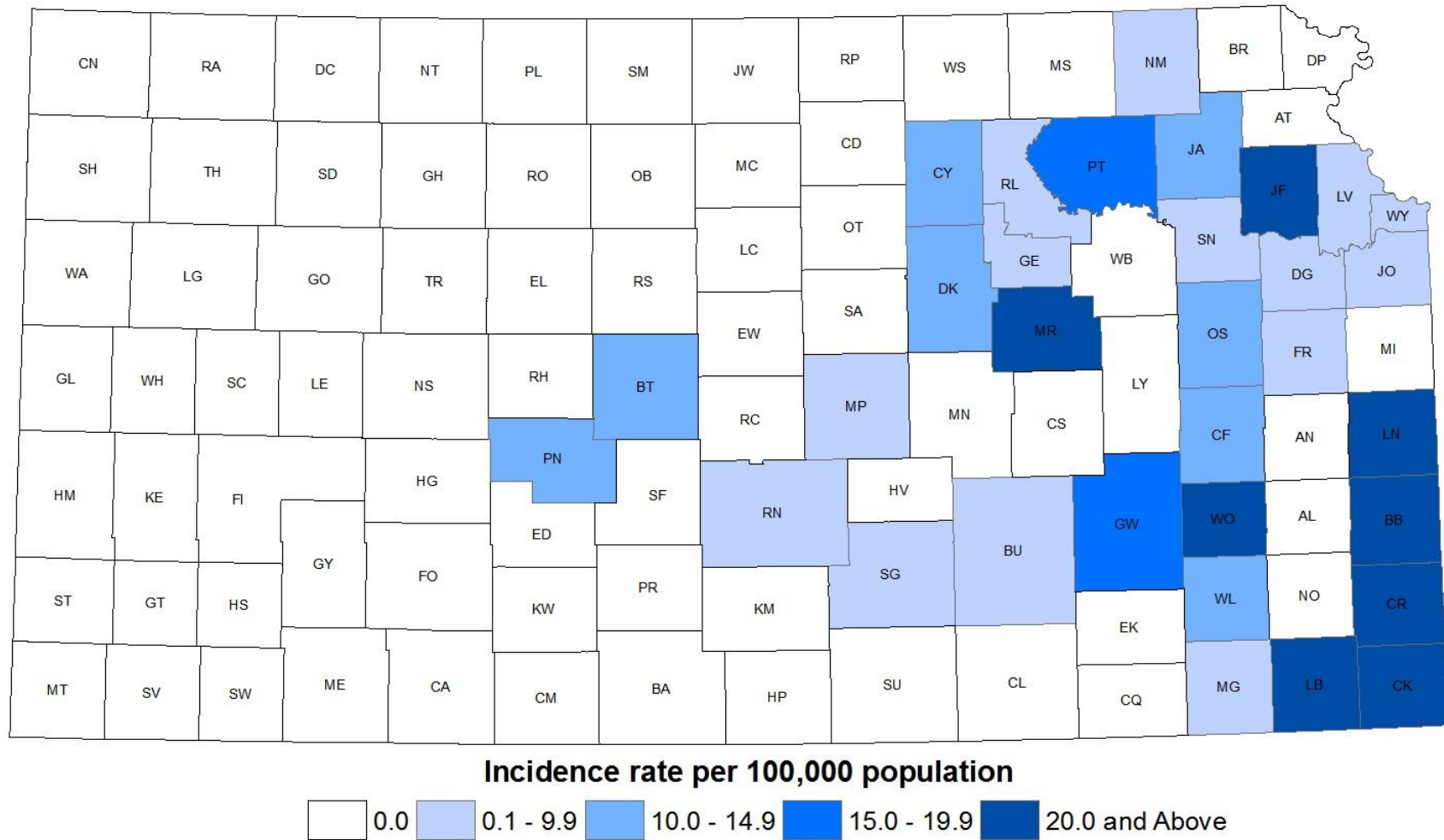
Investigation of reported cases of spotted fever rickettsiosis includes assessment of where the case was most likely bitten by a tick. The most likely Kansas county of exposure was determined for 97 cases; six cases reported tick exposure outside of Kansas, and the location of tick exposure could not be determined for seven cases. All Kansas exposures were reported in the eastern half of the state (Figure 1), which corresponds to the known geographic distribution of the tick vector, *Dermacentor variabilis*.

Confirmed and Probable Cases: 110

Kansas incidence per 100,000 population (2014): 3.80

U.S. incidence per 100,000 population (2013): 1.08

Figure 3: Incidence of spotted fever rickettsiosis per 100,000 population by county or reported tick exposure*, Kansas, 2014 (n=97)



**Cases with reported tick exposure outside their county of residence or unknown exposures were excluded*

STREPTOCOCCAL INVASIVE DISEASE

Group A *Streptococcus* or *Streptococcus pneumoniae*

CLINICAL FEATURES: Symptoms vary and are dependent on the site of infection (e.g. acute otitis media, pneumonia, bacteremia, or meningitis). Group A infections are characterized by sudden onset of fever, shaking chill, pleural pain, dyspnea, tachypnea, and leukocytosis. Infants and young children may experience fever, vomiting, and convulsions.

CAUSATIVE AGENT: Group A *Streptococcus* (*Streptococcus pyogenes*) or *Streptococcus pneumoniae*

MODE OF TRANSMISSION: The organisms may spread directly via respiratory droplets and oral contact. Contact with articles (e.g. tissues) that have been freshly soiled with respiratory discharges may result in indirect transmission. Although the bacteria that cause invasive disease are commonly transmitted from person-to-person, invasive disease is not. Invasive illness among a patient's close and casual contacts is infrequent.

INCUBATION PERIOD: 14 hours to 3 days. (The incubation period is not clearly defined; it may be dependent on the route of infection.)

PERIOD OF COMMUNICABILITY: Untreated patients are most infectious for 2-3 weeks after the illness onset, although transmission may occur until the bacteria are no longer found in respiratory secretions. Patients are not considered infectious 24 hours after treatment has begun.

PUBLIC HEALTH SIGNIFICANCE: School and day care exclusions apply to those with streptococcal pharyngitis or skin infections. Most types of pneumococcal disease (invasive *Streptococcus pneumoniae* infections) can be prevented through vaccination.

REPORTABLE DISEASE IN KANSAS SINCE: All cases of streptococcal invasive disease have been reportable since 2000; drug-resistant strains were made reportable in 2006.

LABORATORY CRITERIA FOR SURVEILLANCE PURPOSES

- Isolation of Group A *Streptococcus* (*Streptococcus pyogenes*) or *Streptococcus pneumoniae* by culture from a normally sterile site (e.g., blood, cerebrospinal fluid, or, less commonly, joint, pleural or pericardial fluid)

SURVEILLANCE CASE DEFINITIONS

- Confirmed: Isolation of Group A *Streptococcus* or *Streptococcus pneumoniae* from a normally sterile body site in a [person](#) of any age.

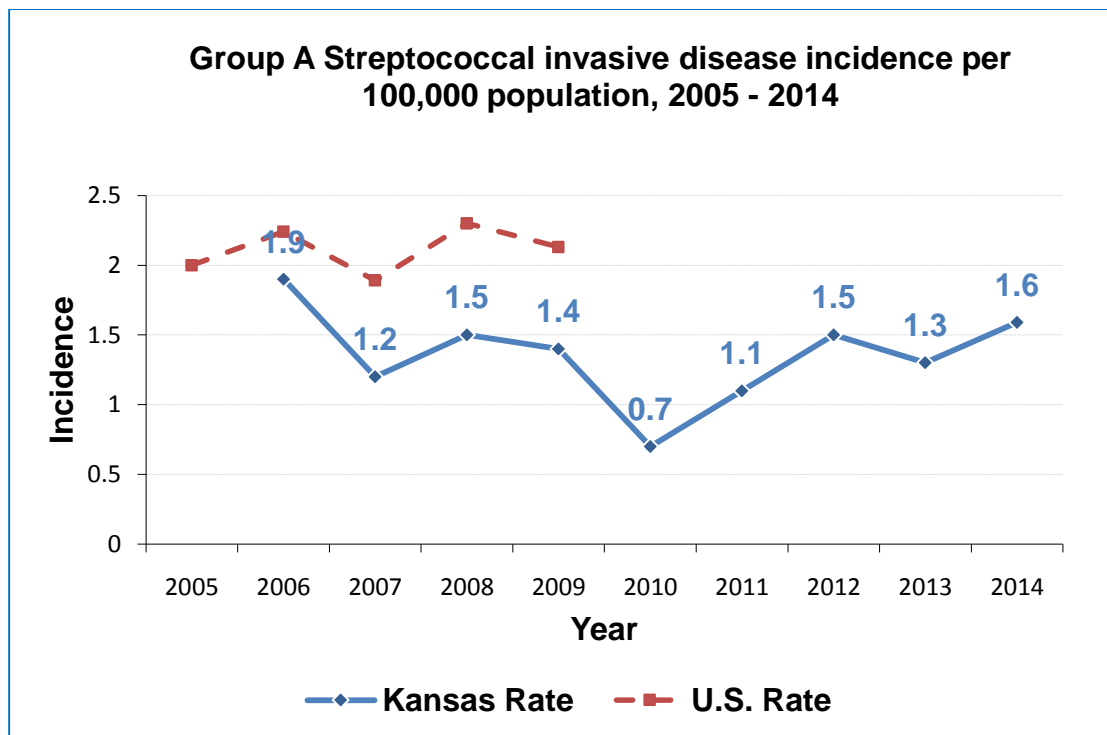
EPIDEMIOLOGY AND TRENDS

In 2014, 46 cases of Group A *Streptococcus* and 136 invasive *Streptococcus pneumoniae* infections were reported in Kansas.

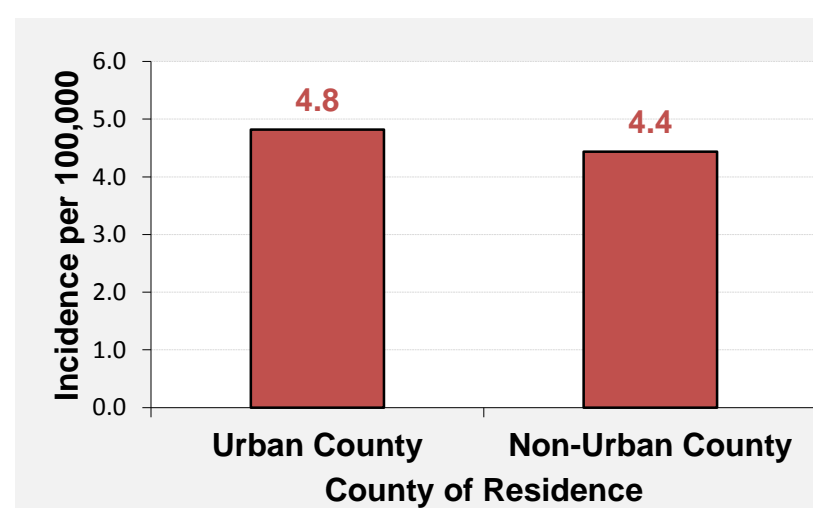
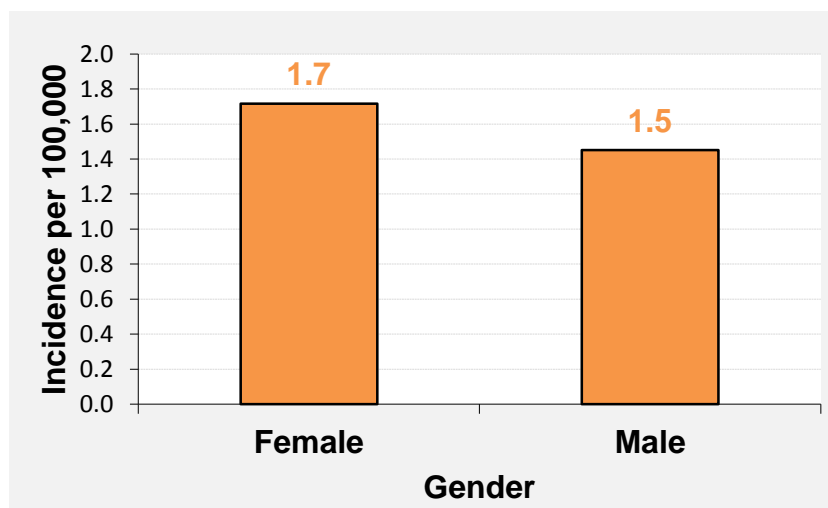
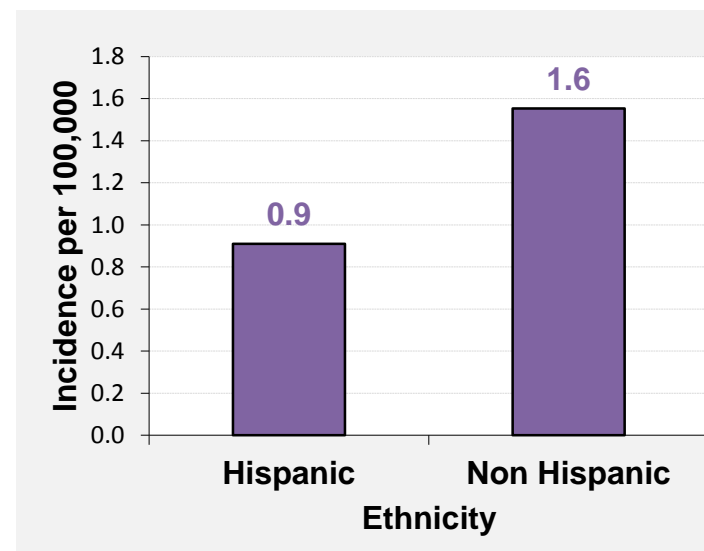
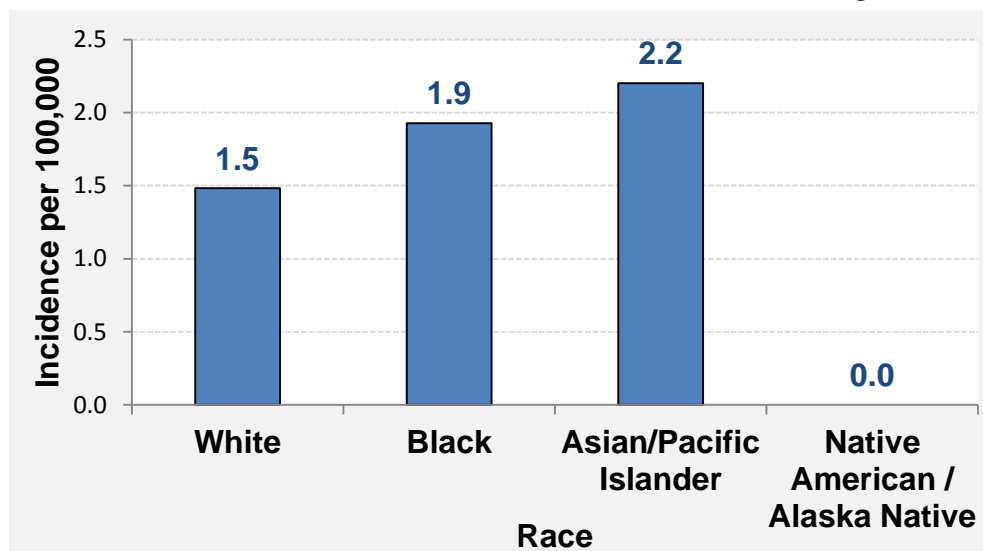
Pneumococcal conjugate vaccine is recommended for children less than 2 years of age, and for high-risk children less than 5 years of age. In 2014, 9 of the 136 *S. pneumoniae* infections occurred among children less than 5 years of age (4.5 per 100,000 population). The reported national incidence for this age group in 2012 was 9 per 100,000 population. Four of the 9 cases were not yet old enough to receive the doses of vaccine needed to be fully protected from the disease.

Pneumococcal polysaccharide vaccine is recommended for adults age 65 and older. In 2014, 58 (43%) of invasive *S. pneumoniae* cases occurred among this age group. The pneumococcal vaccination rate among Kansans age 65 and older is 70.8%, according to the 2010 Kansas Behavioral Risk Factor Surveillance System (BRFSS).

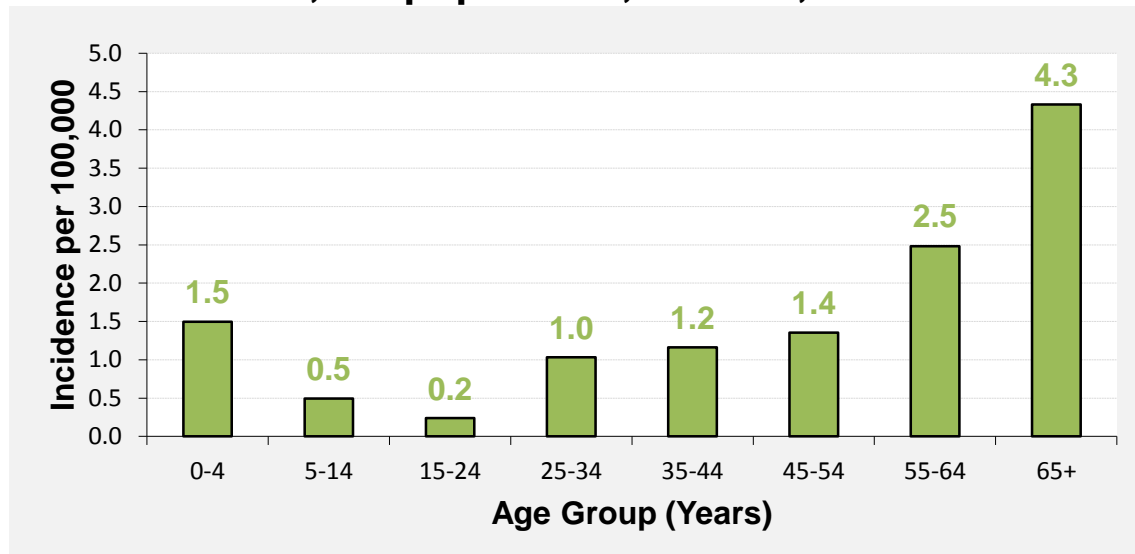
	Group A <i>Streptococcus</i>	<i>Streptococcus pneumoniae</i>
Confirmed Cases:	46	136
Kansas incidence per 100,000 population (2014):	1.59	4.70
U.S. incidence per 100,000 population (2014):	N/A	N/A



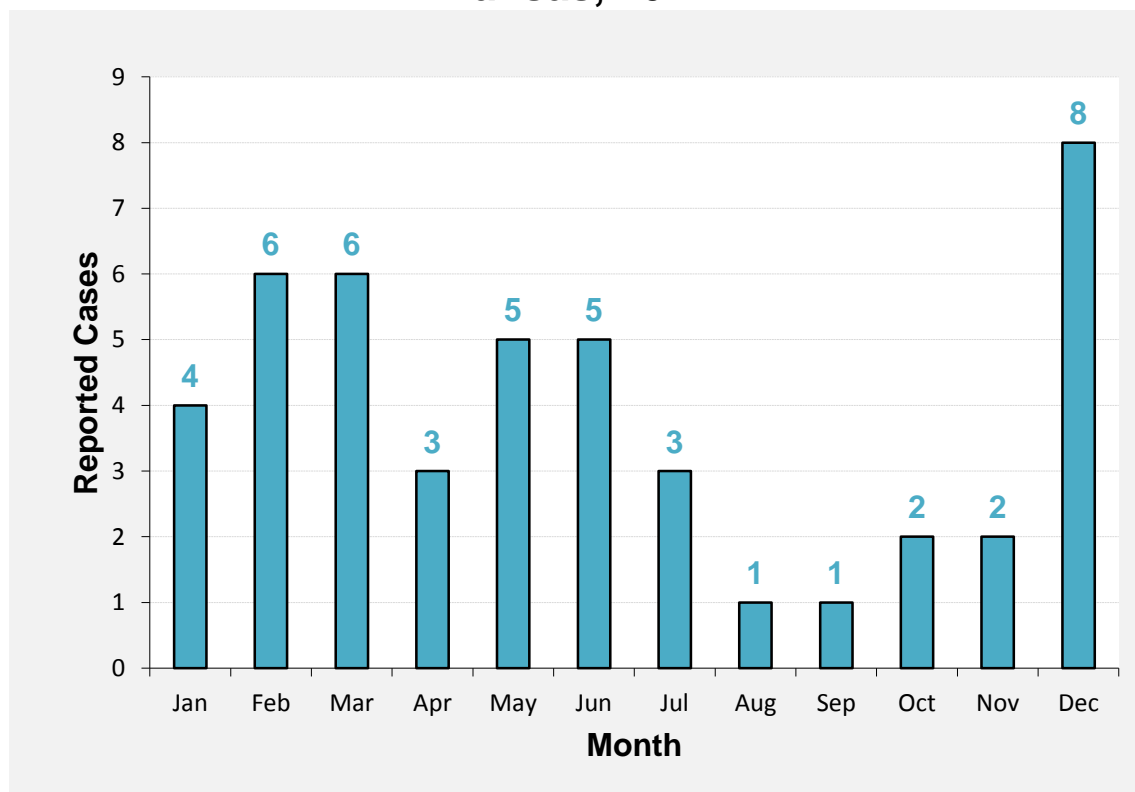
Group A Streptococcal invasive disease incidence per 100,000 population, Kansas, 2014

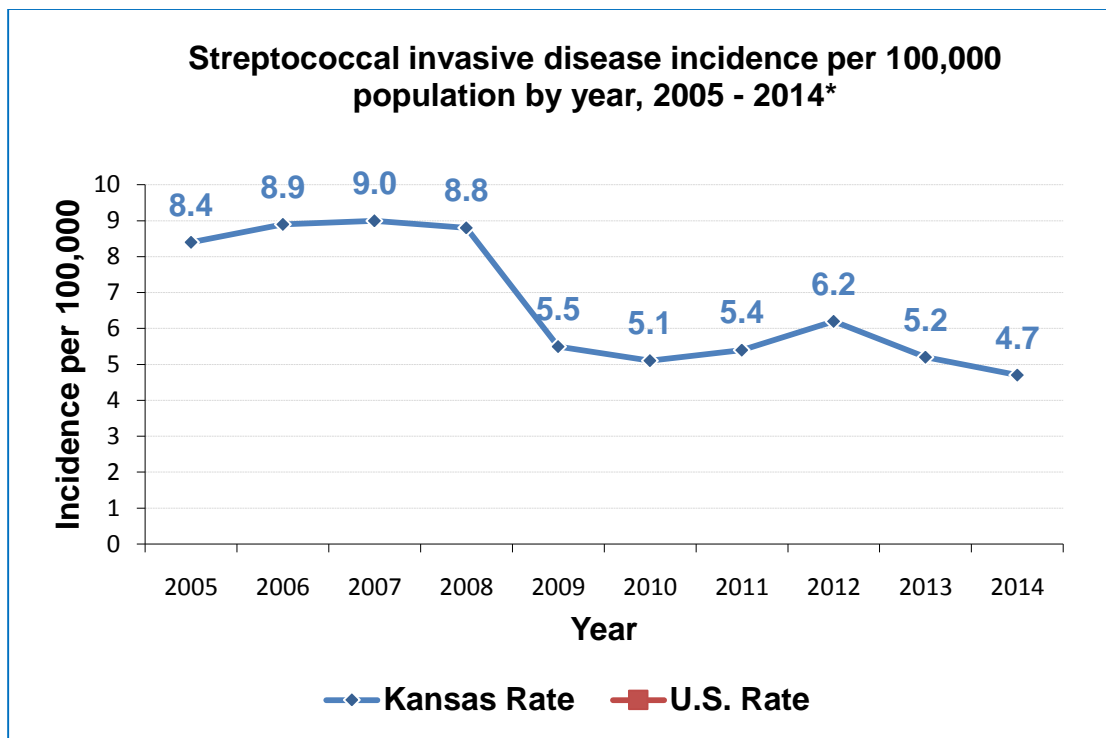


Group A Streptococcal invasive disease incidence per 100,000 population, Kansas, 2014



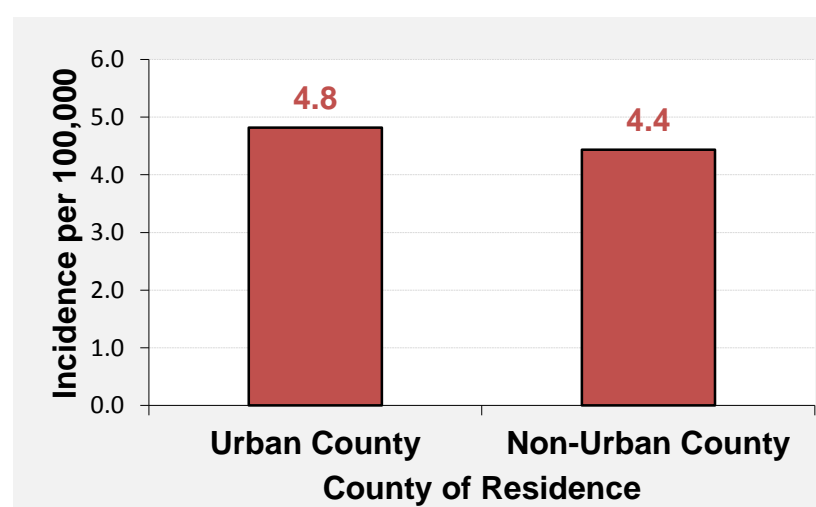
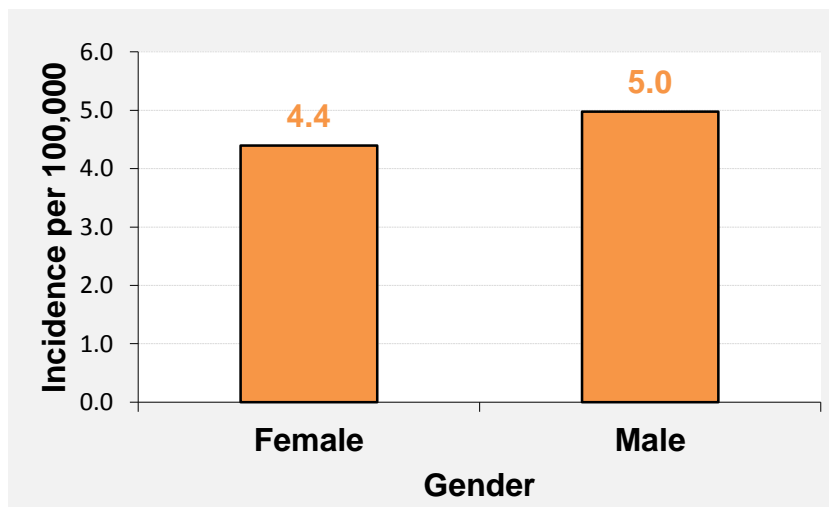
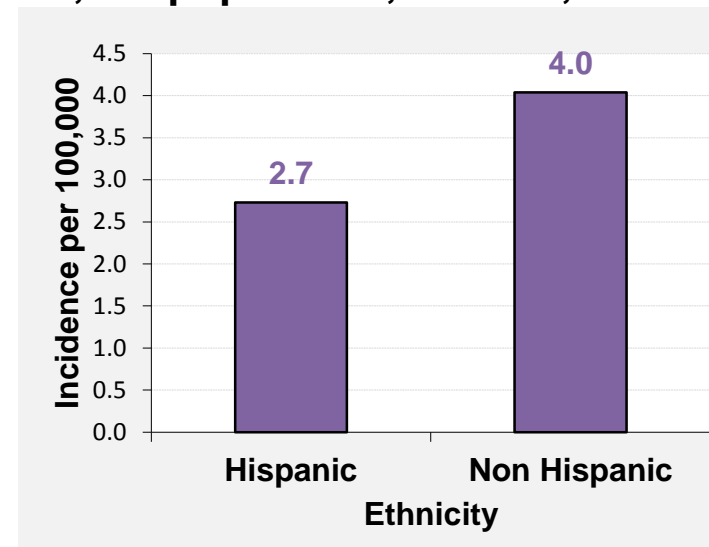
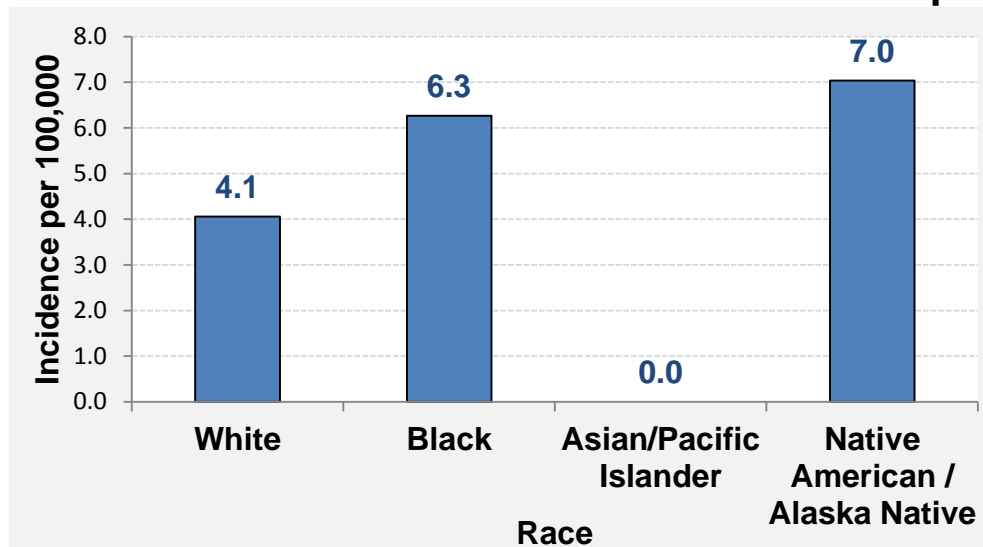
Group A Streptococcal invasive disease cases per month, Kansas, 2014



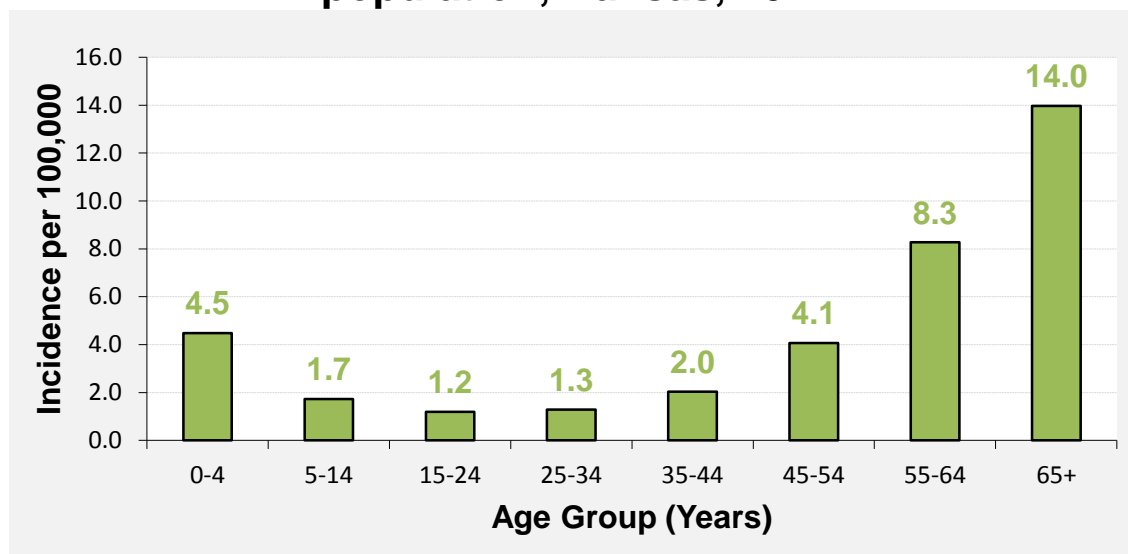


* Only drug-resistant *S. pneumoniae* was reportable in Kansas from 2006 to 2010, and nationally until 2010.

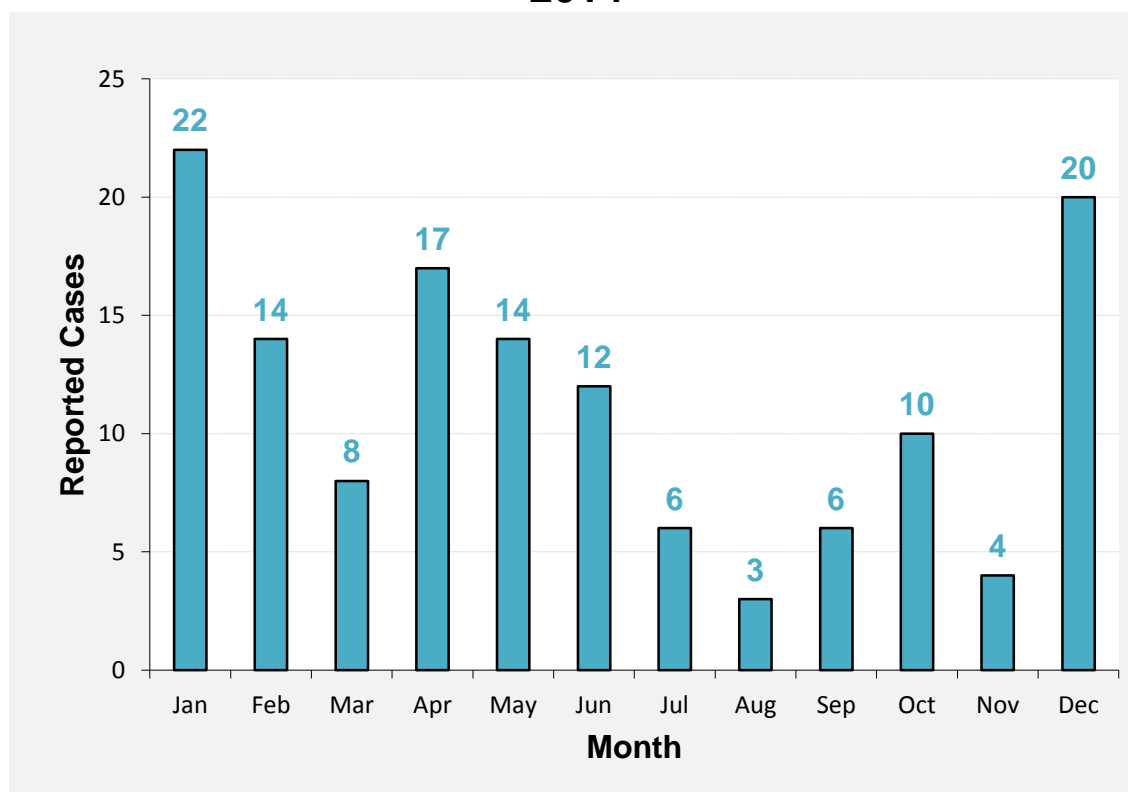
***S. Pneumoniae* invasive disease incidence per 100,000 population, Kansas, 2014**



***S. Pneumoniae* invasive disease incidence per 100,000 population, Kansas, 2014**



***S. Pneumoniae* invasive disease cases per month, Kansas, 2014**



TOXIC SHOCK SYNDROME (STREPTOCOCCAL)

CLINICAL FEATURES: Toxic Shock Syndrome is an acute illness characterized by fever (102.0°F), rash, rapid-onset hypotension, rapidly accelerated renal failure, disseminated intravascular coagulation (DIC), and multisystem organ involvement. Profuse watery diarrhea, vomiting, generalized erythroderma, conjunctival injection, and severe myalgias may be present. It may be associated with local soft tissue infection (cellulites, abscess, myositis, or necrotizing fasciitis) with severe increasing pain, pneumonia, osteomyelitis, bacteremia, pyarthrosis, or endocarditis. Toxic Shock can be confused with Rocky Mountain Spotted fever, Leptospirosis, and measles.

CAUSATIVE AGENT: *Streptococcus pyogenes*, gram-positive bacteria

MODE OF TRANSMISSION: Person-to-person transmission is rare. Nosocomial cases are uncommon but most often have followed surgical procedures.

INCUBATION PERIOD: Not well defined, could be as short as 12 hours for postoperative TSS or 14 hours in cases associated with accidental subcutaneous inoculation of organism; such as during childbirth or after penetrating trauma.

PERIOD OF COMMUNICABILITY: Not applicable.

PUBLIC HEALTH SIGNIFICANCE: Case-fatality ratios with this rare but severe form of TSS can exceed 40% and interest may arise among media, government officials, and the public due to the disease severity. Sustained disease surveillance is needed to assist with the understanding of the pathology and epidemiology of this disease.

REPORTABLE DISEASE IN KANSAS SINCE: 1993

EPIDEMIOLOGY AND TRENDS

Two case of streptococcal toxic shock syndrome were reported in 2014. Zero to four cases (fifteen cases in total) have been reported annually in Kansas since 1999. Hospitalization and death occurred with both cases.

Confirmed and Probable Cases: 2

Kansas incidence per 100,000 population (2014):	0.07
U.S. incidence per 100,000 population (2013):	0.03

TRANSMISSIBLE SPONGIFORM ENCEPHALOPATHY (TSE)

or PRION DISEASE (including Creutzfeldt-Jakob Disease)

CLINICAL FEATURES: Prion diseases or transmissible spongiform encephalopathies (TSEs) are a family of rare progressive neurodegenerative disorders that affect both humans and animals. They are distinguished by long incubation periods, characteristic spongiform changes associated with neuronal loss, and a failure to induce inflammatory response.

CAUSATIVE AGENT: The causative agent of TSEs is believed to be a prion. A prion is an abnormal, transmissible agent that is able to induce abnormal folding of normal cellular prion proteins in the brain, leading to brain damage and the characteristics signs and symptoms of the disease.

MODE OF TRANSMISSION: Most TSEs are believed to occur sporadically, due to the spontaneous transformation of normal prion proteins into abnormal proteins. However, some TSEs, such as Kuru and Variant Creutzfeldt-Jakob Disease (vCJD) have been associated with consumption of infected human or animal tissue.

INCUBATION PERIOD: Varies. TSEs have long incubation periods, measured in years.

PERIOD OF COMMUNICABILITY: Cases may be infectious for the duration of the illness, beginning early in the incubation period.

PUBLIC HEALTH SIGNIFICANCE: While most prion diseases seem to have species barriers, emphasis on disease surveillance and laboratory confirmation are needed to enhance understanding of the pathology and epidemiology of human prion diseases and to implement a system of detecting emerging human prion diseases.

REPORTABLE DISEASE IN KANSAS SINCE: 2007

EPIDEMIOLOGY AND TRENDS

In 2014, two confirmed, fatal cases of TSE were reported in Kansas. Since TSE became reportable in 2007, 1 to 5 cases have been reported annually.

Confirmed Cases: 2

Kansas incidence per 100,000 population (2014): 0.07

U.S. incidence per 100,000 population (2013): N/A

TULAREMIA

CLINICAL FEATURES: Most cases characterized by acute onset of fever, chills, myalgia, and headache appearing with various clinical syndromes dependent on the route of infection. Syndromes include an ulcer at the site of inoculation with regional lymphadenopathy (ulceroglandular); regional lymphadenopathy with no ulcer (glandular); conjunctivitis with preauricular lymphadenopathy (oculoglandular); stomatitis or pharyngitis or tonsillitis with cervical lymphadenopathy (oropharyngeal); intestinal pain, vomiting and diarrhea (intestinal); febrile illness without localizing signs and symptoms (typhoidal); and primary pleuropulmonary disease (pneumonic). Cases with pneumonia can develop chest pain, difficulty breathing, bloody sputum, and respiratory failure.

CAUSATIVE AGENT: *Francisella tularensis*, a gram-negative bacterium.

MODE OF TRANSMISSION: Found in numerous wild animals, especially rabbits, hares, voles, muskrats, beavers, some domestic animals (i.e. dogs and cats), and various hard ticks. The organism is transmitted through the bite of arthropods; by inoculation of skin, conjunctiva or oropharyngeal mucosa with contaminated water, blood or tissue from infected animal carcasses; by handling or ingesting insufficiently cooked meat of infected animals; by drinking contaminated water; by inhalation of contaminated dust or aerosols; rarely, from bites of carnivores whose mouth presumably was contaminated from eating an infected animal; and from contaminated pelts and paws of animals.

INCUBATION PERIOD: The incubation period ranges from 1-14 days (usually 3-5 days).

PERIOD OF COMMUNICABILITY: Not transmitted person-to-person. Draining lesions are potentially infectious.

PUBLIC HEALTH SIGNIFICANCE: In the U.S., risk of exposure is greater for those who spend a great deal of time outdoors; incidence is higher during hunting seasons and when ticks and deer flies are abundant. Illness may be prevented through education on the following risk factors: exposure to arthropod bites, exposure to potentially contaminated water, handling sick or dead wildlife, handling wild game carcasses, and ingestion of undercooked wild game. Tularemia is a potential bioterrorism agent, particularly if distributed as an aerosol.

REPORTABLE DISEASE IN KANSAS SINCE: 1990

LABORATORY CRITERIA FOR SURVEILLANCE PURPOSES

- Confirmed infection:
 - Isolation of *F. tularensis* from a clinical specimen, **OR**
 - Fourfold or greater change in serum antibody titer to *F. tularensis* antigen.
- Presumptive infection:
 - Elevated serum antibody titer(s) to *F. tularensis* antigen (without documented fourfold or greater change) in a patient with no history of tularemia vaccination, **OR**
 - Detection of *F. tularensis* in a clinical specimen by fluorescent assay.

SURVEILLANCE CASE DEFINITIONS

- *Confirmed*: A clinically compatible illness that is laboratory confirmed.
- *Probable*: A clinically compatible case with laboratory results indicative of presumptive infection.

EPIDEMIOLOGY AND TRENDS

Twenty-seven cases (10 confirmed and 17 probable) of tularemia were reported in Kansas during 2013. The cases ranged from 3 to 89 years of age, with a median age of 48 years. Eighteen (67%) cases were male. The three-year median for 2011-2013 was 22 cases. Two to eleven cases have been confirmed annually since 1990.

Among the 2014 cases, ulceroglandular syndrome was reported in 11 cases, glandular syndrome was noted in four cases, and 12 cases did not have a primary syndrome reported. Tick bites were reported in 14 cases and nine cases had contact with sick or dead animals. There were no deaths, but 12 hospitalizations were reported, representing 44% of the cases.

Confirmed and Probable Cases: 27

Kansas incidence per 100,000 population (2014): 0.93

U.S. incidence per 100,000 population (2013): 0.06

TYPHOID FEVER

CLINICAL FEATURES: Insidious onset of sustained fever, marked headache, malaise, anorexia, relative bradycardia, splenomegaly, constipation or diarrhea, rose-colored spots on the trunk and nonproductive cough. Severity of symptoms can range from mild illness to invasive disease and complications, including death. Many mild and atypical infections occur, especially in endemic areas. Carriage of *S. Typhi* may be prolonged.

CAUSATIVE AGENT: *Salmonella Typhi* bacterium (*S. enterica* subsp. *enterica* serovar Typhi, formerly known as *S. typhi*).

MODE OF TRANSMISSION: Humans are the only reservoir; therefore, ingestion of food (shellfish, fruit, vegetables) and water contaminated by feces and urine of *S. Typhi* cases and asymptomatic carriers are the main sources of infection. Flies also promote spread of disease.

INCUBATION PERIOD: From 3 days to over 60 days, usual range 8-14 days.

PERIOD OF COMMUNICABILITY: Dependent upon the presence of organisms in excreta, communicability is usually from the first week throughout convalescence. Among 10% of untreated patients, this can be up to 3 months. Between 2% and 5% become permanent carriers.

PUBLIC HEALTH SIGNIFICANCE: Despite the availability of a vaccine and treatment, about 12.5 million persons in developing countries experience typhoid fever annually. A case-fatality rate of 15-20% is also observed among cases who do not receive prompt treatment. Typhoid fever infection can be prevented through access to safe water, proper sanitation, avoiding consumption of risky foods and liquids, and becoming immunized.

REPORTABLE DISEASE IN KANSAS SINCE: 1982

CLINICAL CRITERIA

- Insidious onset of sustained fever, headache, malaise, anorexia, relative bradycardia, constipation or diarrhea, and nonproductive cough.

LABORATORY CRITERIA FOR SURVEILLANCE PURPOSES

- Isolation of *S. Typhi* from blood, stool, or other clinical specimen.

SURVEILLANCE CASE DEFINITIONS

- *Confirmed:* A clinically compatible case that is laboratory confirmed (*NOTE: Isolation of the organism is required for confirmation. Serologic evidence alone is not sufficient for diagnosis. Asymptomatic carriage should not be reported as typhoid fever.*)
- *Probable:* A clinically compatible case that is epidemiologically linked to a confirmed case in an outbreak

EPIDEMIOLOGY AND TRENDS

One confirmed case of typhoid fever was reported in Kansas during 2014. The case reported travel to an area of the world where typhoid fever is endemic. Since 1994, zero to four cases have been reported annually.

Confirmed Cases: 1

Kansas incidence per 100,000 population (2014): 0.03

U.S. incidence per 100,000 population (2013): 0.11

VARICELLA (CHICKENPOX)

CLINICAL FEATURES: The disease is characterized by a generalized, pruritic rash that progresses from macules to papules to vesicular lesions before crusting. Healthy, unvaccinated children normally have 200-500 lesions in 2 to 4 successive crops — the lesions are more highly concentrated on the trunk than the extremities. Rash is usually the first sign of disease in children, followed by malaise, fever, and itching. Adults may experience fever and malaise in the 1 - 2 days prior to rash onset; the clinical course in adults is often more severe than what is seen in children. Adults also have a higher risk of complications, including secondary bacterial infections, pneumonia, dehydration, aseptic meningitis, and encephalitis.

CAUSATIVE AGENT: varicella zoster virus (VZV)

MODE OF TRANSMISSION: The virus is highly transmissible from person to person. Direct contact with a case, or contact with a case's vesicle fluid or respiratory secretions (via airborne or droplet spread) may cause infection. Indirect transmission may occur if a case's vesicle fluid or respiratory secretions have soiled clothing, linens, etc.

INCUBATION PERIOD: The incubation period may range from 10 to 21 days; the average incubation period is 14 - 16 days from exposure.

PERIOD OF COMMUNICABILITY: Cases are usually infective from 1 - 2 days before the onset of rash until all lesions are crusted. Cases with altered immunity may be infectious for a longer period of time.

PUBLIC HEALTH SIGNIFICANCE: A vaccine to protect against VZV is available; vaccination is required for school entry in Kansas. Disease has been reported in vaccinated children, although these "breakout" illnesses have been mild—vaccinated children that contract varicella normally report fewer lesions (less than 50), no fever, and a shorter duration of illness compared to non-vaccinated individuals. School and daycare restrictions apply to infected enrollees. The vaccine is also effective as postexposure prophylaxis in susceptible persons.

REPORTABLE DISEASE IN KANSAS SINCE: 2003

CLINICAL CRITERIA FOR SURVEILLANCE PURPOSES

- An illness with acute onset of diffuse (generalized) maculo-papulovesicular rash without other apparent cause.

LABORATORY CRITERIA FOR SURVEILLANCE PURPOSES

- Isolation of varicella virus from a clinical specimen, **OR**
- Varicella antigen detected by direct fluorescent antibody test (DFA), **OR**
- Varicella-specific nucleic acid detected by polymerase chain reaction (PCR), **OR**

- Significant rise in serum varicella immunoglobulin G (IgG) antibody level by any standard serologic assay

SURVEILLANCE CASE DEFINITIONS

- *Confirmed:*
 - An acute illness with diffuse (generalized) maculo-papulovesicular rash, **AND**
 - Epidemiologic linkage to another probable or confirmed case, **OR**
 - Laboratory confirmation by any of the following:
 - Isolation of varicella virus from a clinical specimen, **OR**
 - Varicella antigen detected by direct fluorescent antibody test, **OR**
 - Varicella-specific nucleic acid detected by polymerase chain reaction (PCR), **OR**
 - Significant rise in serum anti-varicella immunoglobulin G (IgG) antibody level by any standard serologic assay.
- *Probable:* An acute illness with
 - Diffuse (generalized) maculo-papulovesicular rash, **AND**
 - Lack of laboratory confirmation, **AND**
 - Lack of epidemiologic linkage to another probable or confirmed case.

EPIDEMIOLOGY AND TRENDS

In 2014, 294 (60 confirmed and 234 probable) cases of varicella (chickenpox) were reported in Kansas. Varicella has been a reportable disease since 2003 in Kansas—previously, only deaths resulting from varicella were reportable.

One outbreak was reported, accounting for five (2%) of the confirmed cases. This outbreak occurred in a school setting in Reno County. Ages ranged from 1 - 9 years old. All cases met clinical case definition with a maculo-papulovesicular rash and were epidemiologically linked. Three of the five cases were not vaccinated.

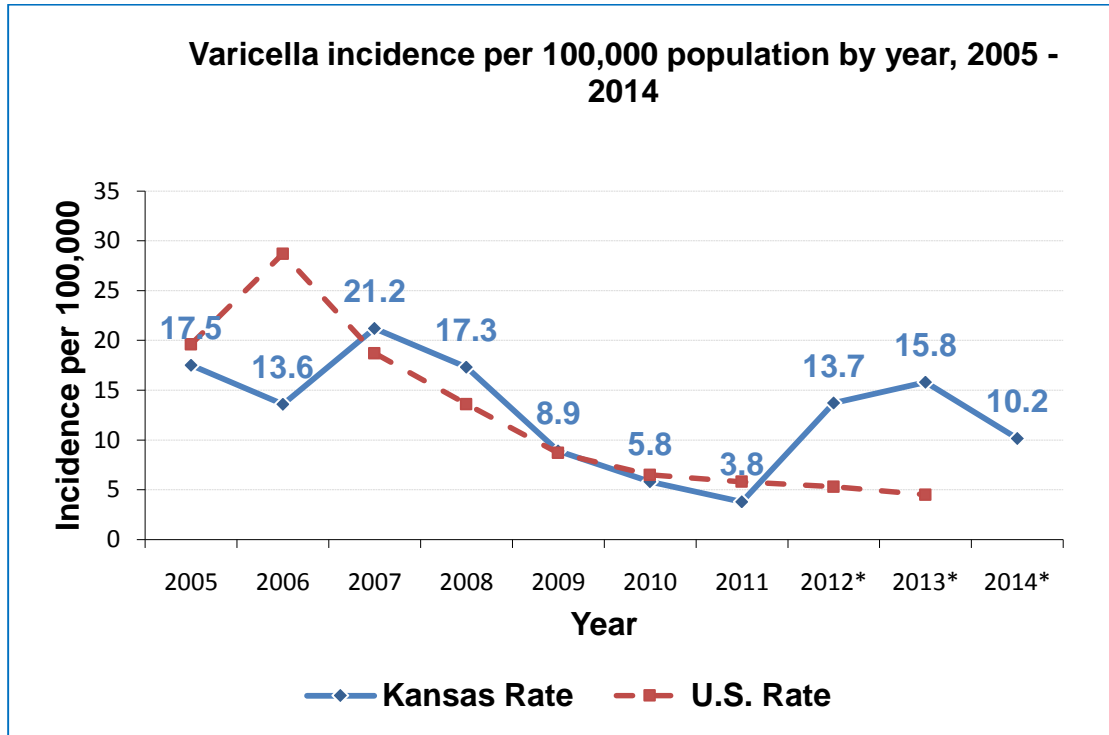
The vast number of varicella case reports received by KDHE precluded exhaustive investigation of every case; as a result, some cases may have been reported as “probable” rather than “confirmed”. For example, a case may be counted as “confirmed” if it is linked to another infected person, but this link may not be revealed without intensive follow-up. Unlinked, non-laboratory-confirmed cases were counted as “probable” cases—234 probable cases were reported during 2014.

Of the 294 confirmed and probable cases, transmission setting was known for 131 cases (45%). The most common transmission setting reported was “home,” which accounted for 50 cases (38%) where transmission setting was known. Schools reported thirty-seven cases (28%) where transmission setting was known.

Confirmed and Probable Cases: 294

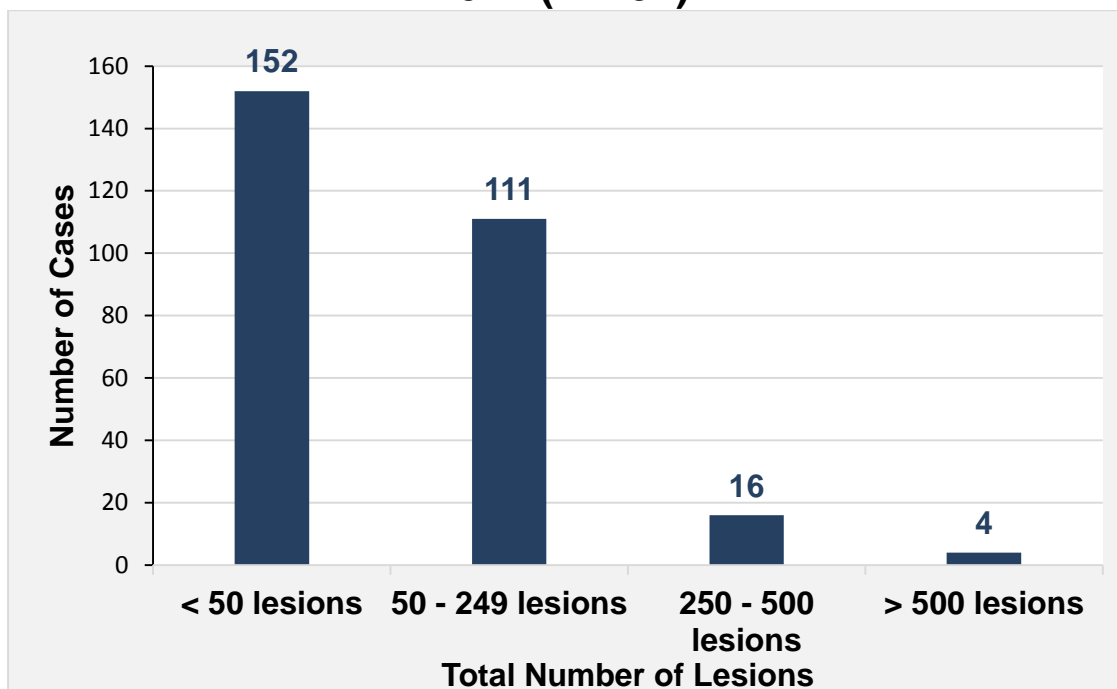
Kansas incidence per 100,000 population (2014): 10.16

U.S. incidence per 100,000 population (2013): 4.62



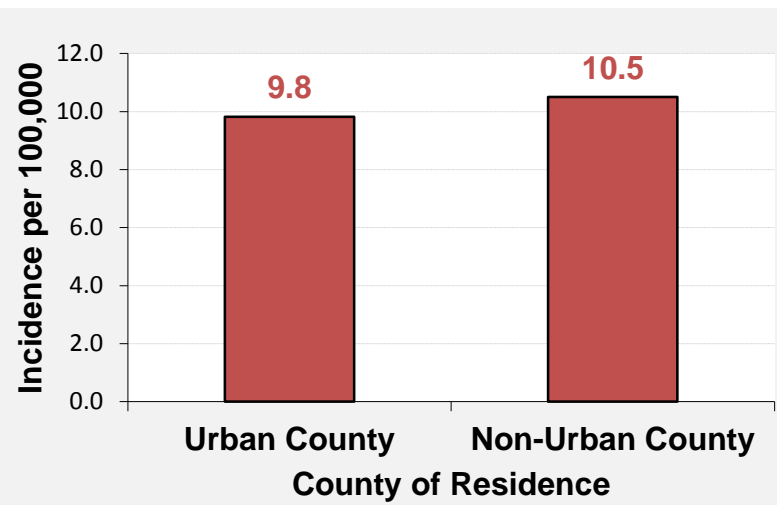
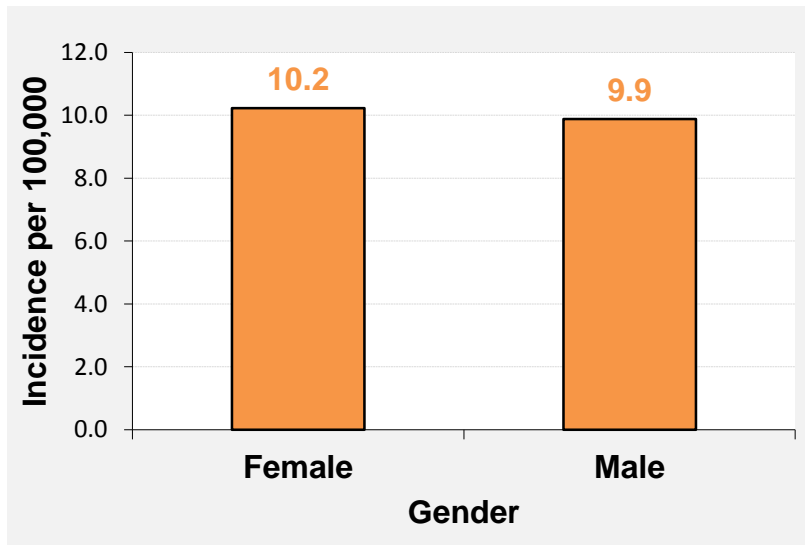
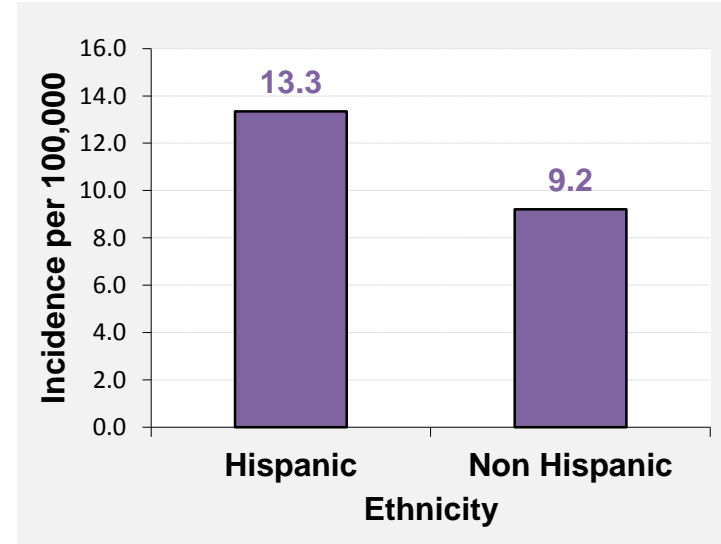
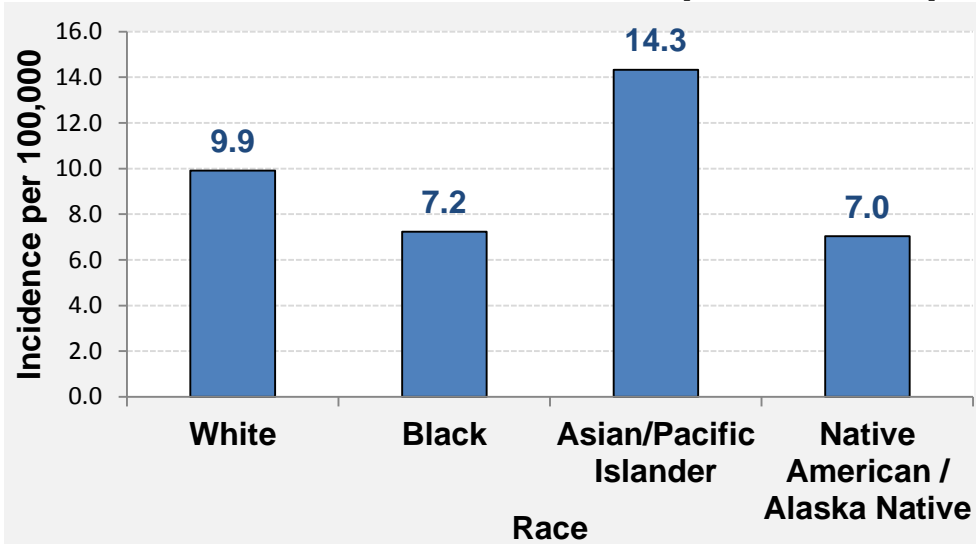
* Kansas incidence includes confirmed and probable cases

**Varicella cases reported by total number of lesions, Kansas,
2014 (n=294)***

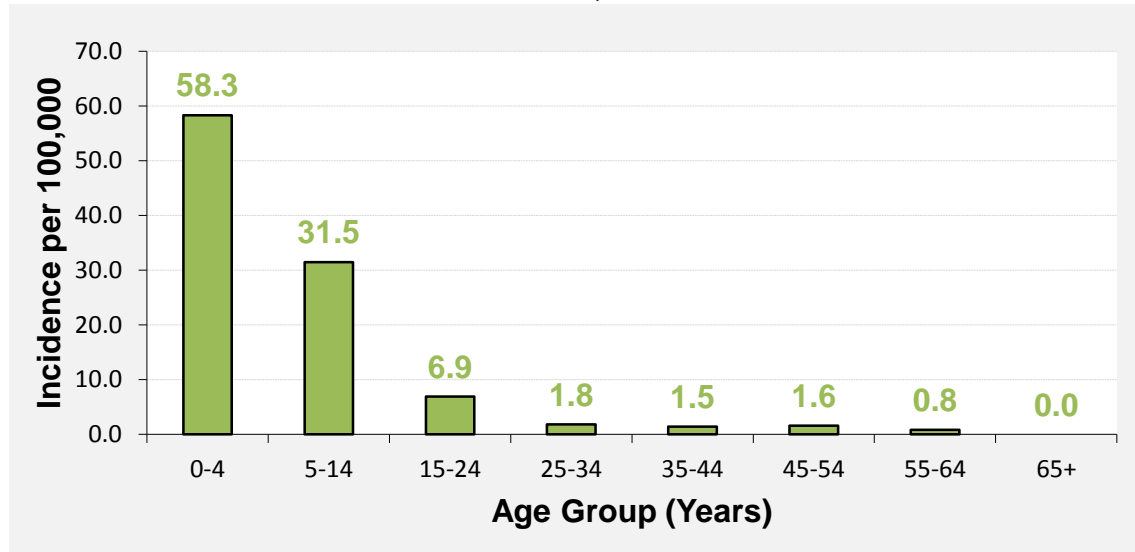


** Total number of lesions unknown for 11 cases*

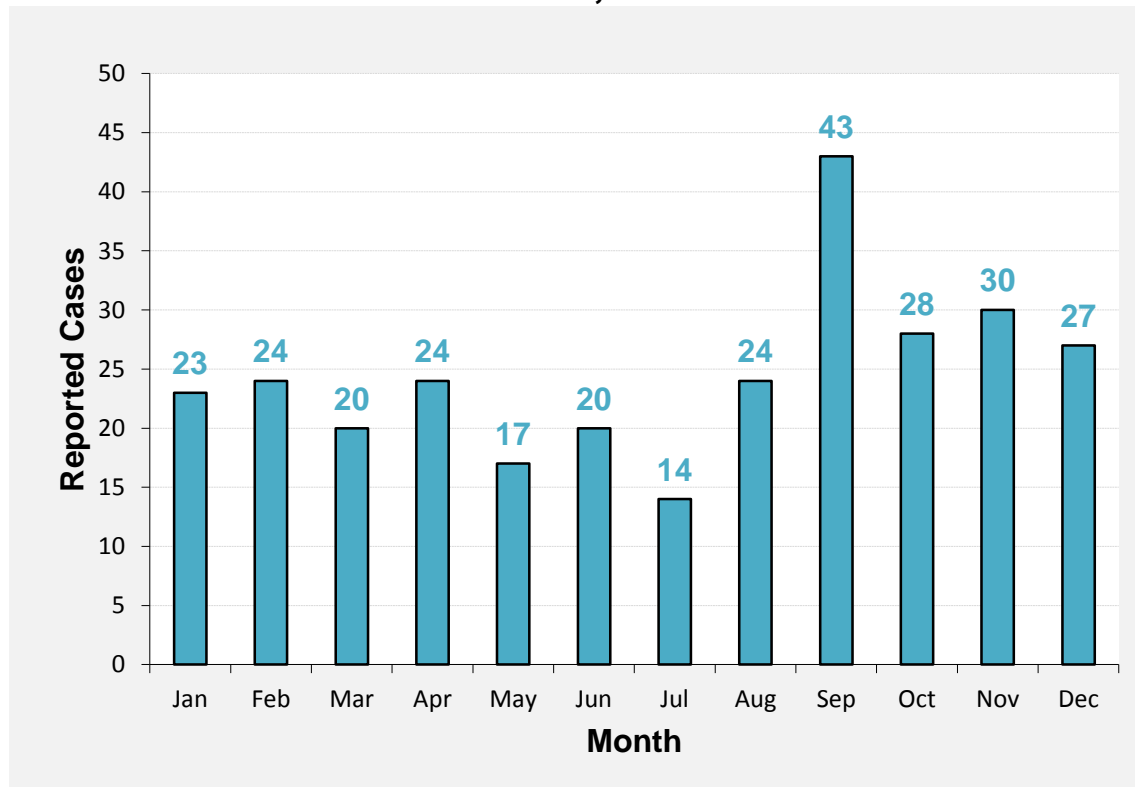
Varicella incidence per 100,000 population, Kansas, 2014



Varicella incidence per 100,000 population Kansas, 2014



Varicella cases per month Kansas, 2014



SECTION II: SPECIAL SURVEILLANCE PROJECTS

KANSAS INFLUENZA SURVEILLANCE, 2014-2015



INTRODUCTION

Influenza is not a nationally notifiable disease, nor is it a notifiable disease in Kansas. Because patient-level data is not reported to state health departments or to the Centers for Disease Control and Prevention (CDC), the burden of disease must be tracked through non-traditional methods. Influenza surveillance in Kansas consists of four components that provide data on outpatient influenza-like illness, influenza viruses, and influenza-associated deaths.

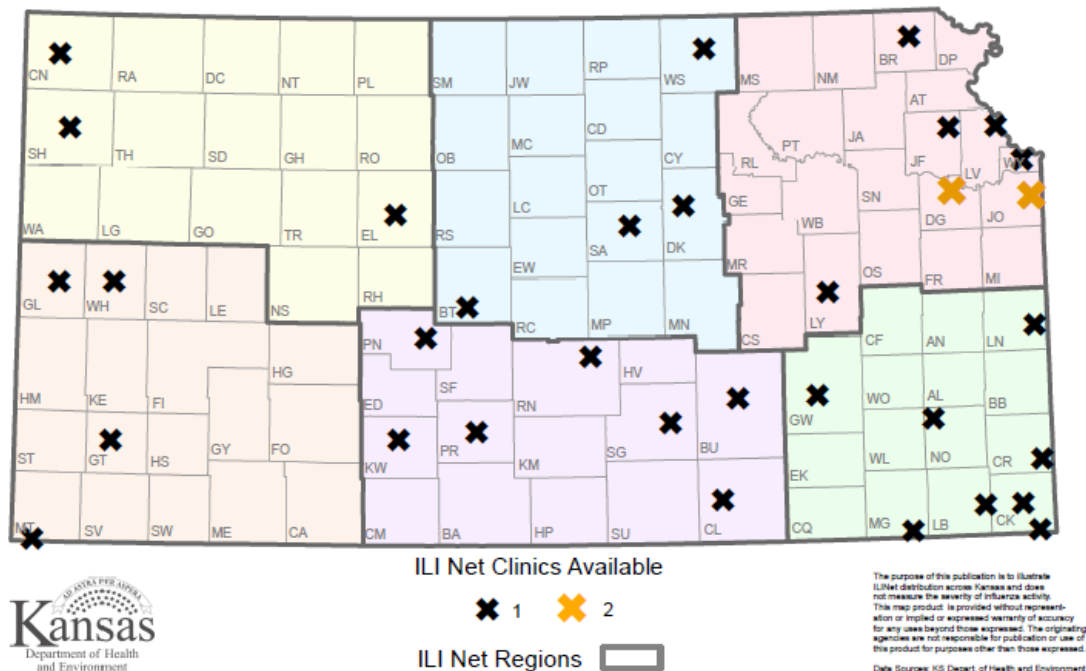
MORBIDITY SURVEILLANCE FROM THE U.S. OUTPATIENT INFLUENZA-LIKE ILLNESS SURVEILLANCE NETWORK (ILINet)

The U.S. Outpatient Influenza-like Illness Surveillance Network (ILINet) is a collaboration between the CDC and state, local, and territorial health departments. The purpose of the surveillance is to track influenza-like illness (ILI), recognize trends in influenza transmission, determine the types of influenza circulating, and detect changes in influenza viruses. Influenza-like illness is defined by the CDC as fever ($\geq 100^{\circ}\text{F}$ or $\geq 37.8^{\circ}\text{C}$, measured either at the ILINet site or at the patient's home) with cough and/or sore throat, in the absence of a known cause other than influenza.

The Bureau of Epidemiology and Public Health Informatics (BEPHI) at the Kansas Department of Health and Environment (KDHE) recruited health care providers throughout Kansas to participate in ILINet. Each week, ILINet site personnel determined the total number of patients seen with ILI during the previous week by age group — preschool (0-4 years), school age through college (5-24 years), adults (25-49 years and 50-64 years), and older adults (>64 years). In addition, the total number of patients seen during the previous week for any illness was recorded. This data was submitted to the CDC via the internet or fax; sites are asked to report the previous week's data by 11:00 AM each Tuesday.

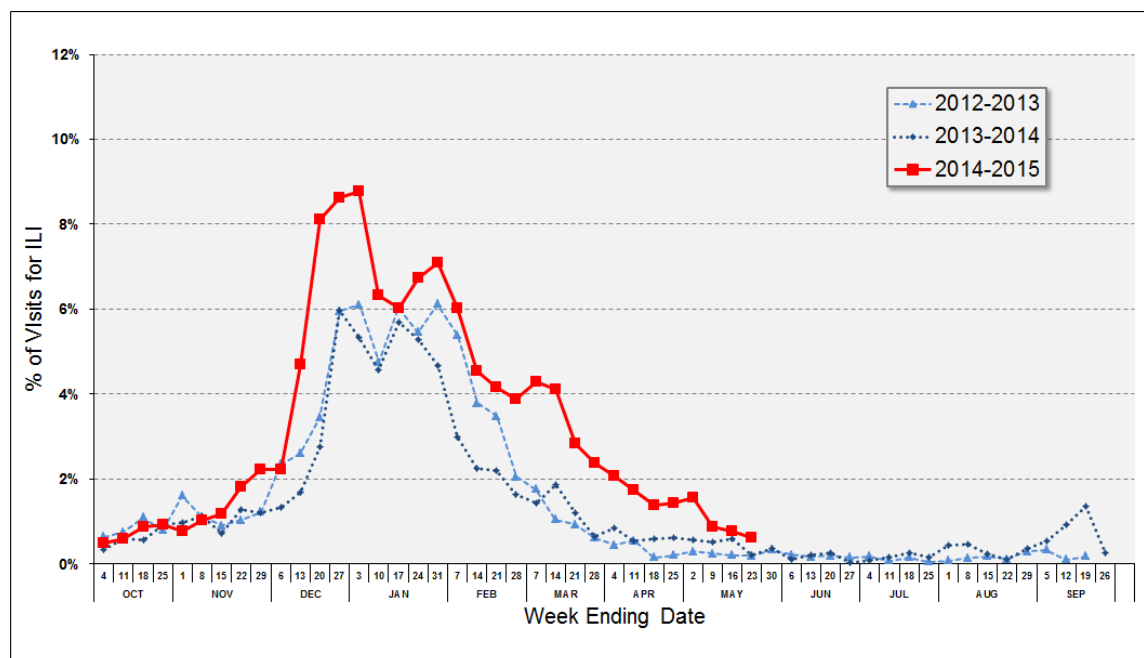
When the surveillance period began during the week ending October 4, 2014, 37 health care providers were enrolled in ILINet. Three sites dropped out during the week ending January 10, 2014 after failing to submit any data. As a result, the 2014-2015 surveillance data was collected from 35 sites throughout the state: 20 family practice clinics, nine hospital emergency departments, four university student health centers, and two pediatric clinics (Figure 1).

Figure 1. Sites enrolled in the U.S. Outpatient Influenza-like Illness Surveillance Network (ILINet), Kansas, September 28, 2014 – May 23, 2015 (n=35)



During the influenza surveillance period, starting September 28, 2014 (week 40) and ending May 23, 2015 (week 20), sites observed a total of 218,686 patients—7,306 (3.3%) sought care for ILI. The rate of ILI rose steadily from November 2014 through December 2014. The ILI rate peaked at 8.8% during the week ending January 3, 2015. The rate of ILI dropped below 2% during the week ending April 11, 2015 and remained low through the end of the surveillance period (Figure 2).

Figure 2. Percentage of visits for influenza-like illness (ILI) reported by ILINet sites, Kansas, October 2014 – May 2015 and previous two surveillance periods*



**ILINet sites may vary in number and type (student health, family practice, etc.) each season. Data from the previous two surveillance years are plotted according to week number corresponding to the 2014-2015 week ending date; for example, week 40 ended October 5, 2014, week 40 of 2013 ended October 6, 2012, and week 40 of 2012 ended October 7, 2011.*

LABORATORY SURVEILLANCE

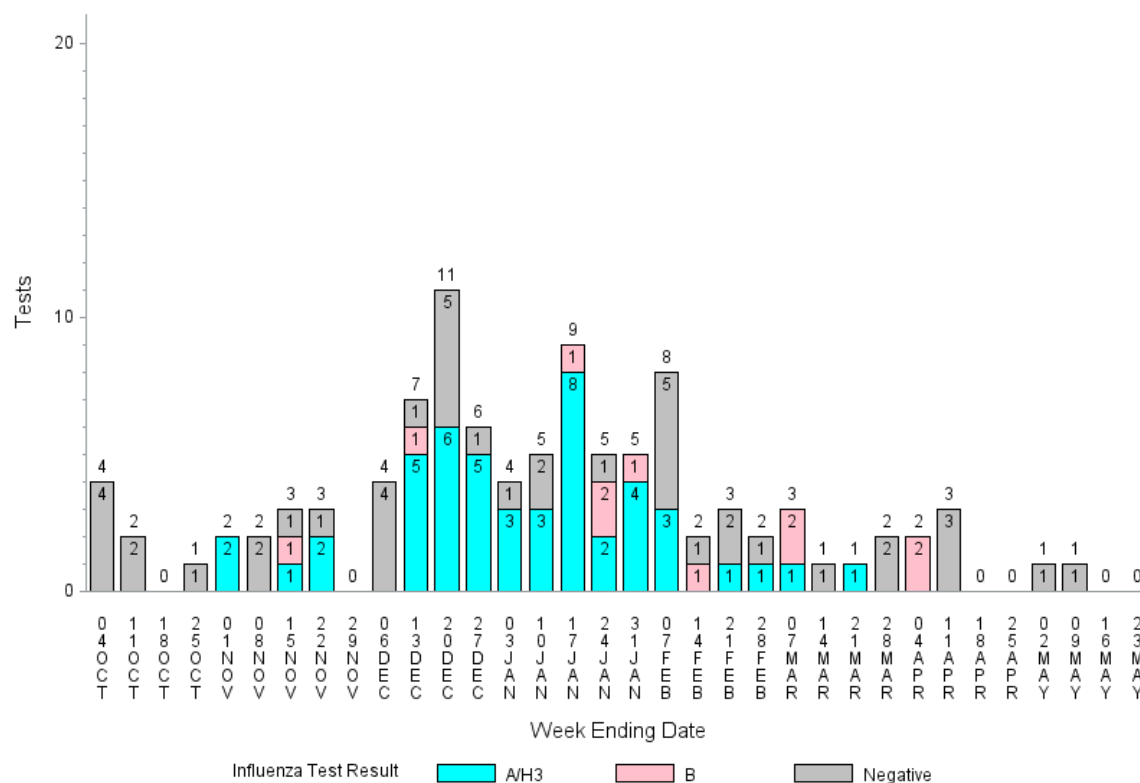
The Kansas Health and Environmental Laboratories (KHEL) provided confirmatory testing for ILINet site patients with ILI, as well as for hospitalized patients throughout the state. Real-Time Polymerase Chain Reaction (RT-PCR) tests were used to analyze nasal and nasopharyngeal swabs for the presence of influenza virus. Laboratory data was sent weekly to CDC by KHEL. In addition, KHEL forwarded a subset of its specimens to CDC for subtyping, antigenic characterization, and antiviral resistance testing.

From September 30, 2014, when the first respiratory specimen for influenza testing was received, until May 23, 2015, when the 2014-2015 surveillance period ended, KHEL tested 102 specimens for influenza. ILINet sites submitted 46 (91%) specimens; the remainder was submitted by hospitals or tested for outbreak investigations. Influenza was detected in 59 (58%) of the specimens. Both influenza type A and B viruses were detected. One influenza A subtype, A/H3, and influenza B were seen. The influenza A/H3 subtype was most frequently detected, representing of 81% of all positive specimens (Table 1, Figure 3).

Table 1: Laboratory-confirmed influenza viruses tested at Kansas Health and Environmental Laboratories by subtype, Kansas, September 30, 2014 – May 23, 2015 (n=102)

Influenza subtype	Number	Percent of Total
A/H3	48	81%
B	11	19%

Figure 3: Influenza specimens tested at Kansas Health and Environmental Laboratories by week ending date, September 30, 2014 – May 23, 2015 (n=102)



KHEL sent 30 positive influenza specimens to CDC for antigenic characterization. Antigenic characterization testing performed on influenza isolates submitted by all states to the CDC showed that 100% of the A/H1 isolates, 19% of the A/H3, 98% of both B lineages matched their corresponding components in the 2014-2015 seasonal influenza vaccine.

RESPIRATORY VIRAL PANEL TESTING

A subset of specimens which test negative for influenza by RT-PCR at the Kansas Health and Environmental Laboratories (KHEL) were tested using the Luminex PCR instrument. The Luminex assay probed for the following 12 viral targets per specimen: influenza A, influenza A subtype H1, influenza A subtype H3, influenza B, respiratory syncytial virus subtype A,

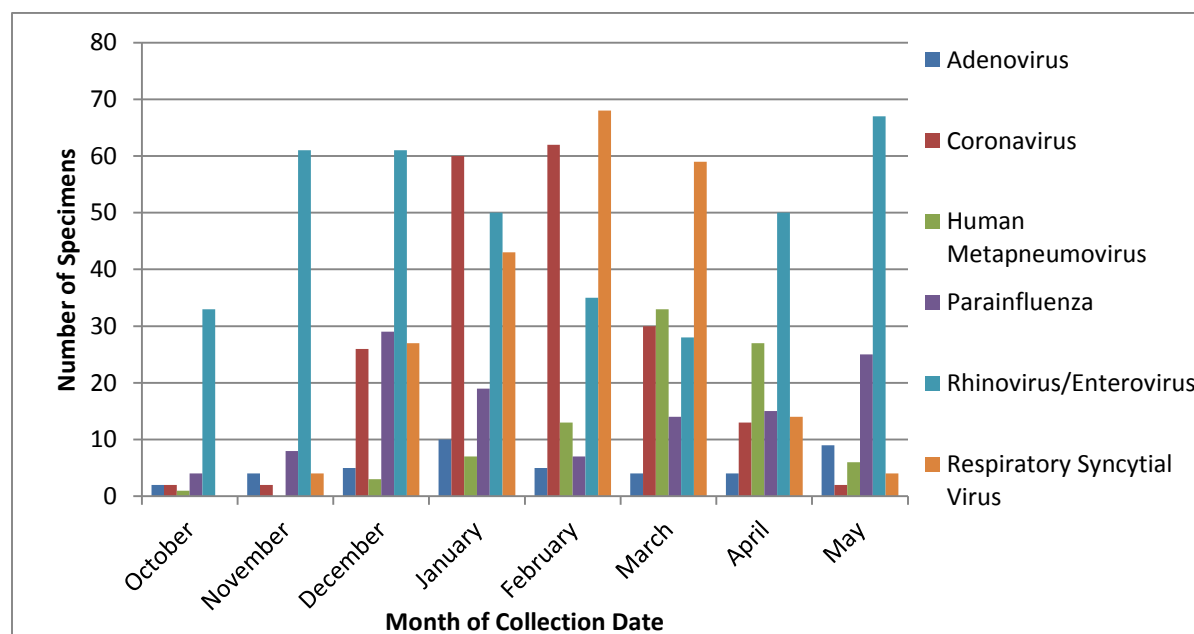
respiratory syncytial virus subtype B, parainfluenza 1, parainfluenza 2, parainfluenza 3, human metapneumovirus, rhinovirus, and adenovirus. The goal of Luminex testing was to better understand which respiratory viruses were circulating in Kansas during influenza season.

For the 2014-15 season, Via Christi Laboratories in Sedgwick County shared its RVP data with KDHE. Via Christi Laboratories' RVP can detect Parainfluenza 4 and four different coronaviruses in addition to the 12 targets in the RVP panel used by KHEL; RVP results were sent to KDHE monthly and represented the majority of respiratory virus surveillance in the south central region of Kansas. The resources available at KHEL focused on the remaining five regions of the state.

A total of 48 specimens were tested on the KHEL Luminex assay, 30 of which were negative for all viral targets. Rhinovirus/enterovirus was the most common virus found (n=9). The other viruses identified using Luminex included adenovirus (n=2), human metapneumovirus (n=2) and parainfluenza 3 (n=1). The KHEL RVP specimens showed no time-specific disease trends over this surveillance period.

Via Christi saw many respiratory virus trends during the flu season (Figure 5). The most common virus found was rhinovirus/enterovirus, which declined throughout the season. They also reported high numbers of respiratory syncytial virus and coronaviruses during peak flu season. Other viruses detected were adenovirus, human metapneumovirus, and parainfluenza.

Figure 5: Positive Respiratory Viral Panel Results, Via Christi Laboratories, October 2014 – May 2015

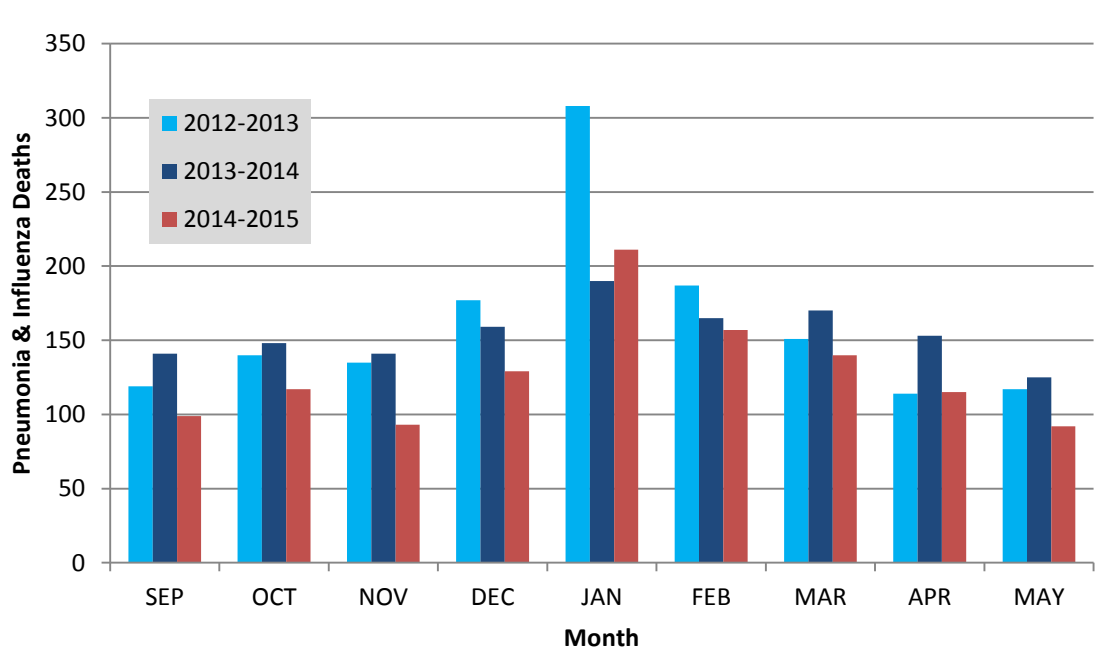


PNEUMONIA AND INFLUENZA (P&I) MORTALITY

BEPHI monitored influenza-related mortality. Death certificate data was collected to determine the number of deaths caused by pneumonia or influenza (P&I). Mortality was divided among three categories: pneumonia or influenza recorded as a contributing factor of death, influenza recorded as the direct cause of death, and pneumonia recorded as the direct cause of death.

Traditionally, P&I mortality data includes deaths that occurred from September through May. During the 2014-2015 period, the largest number of P&I deaths (n=211) were recorded in the month of January (Figure 6).

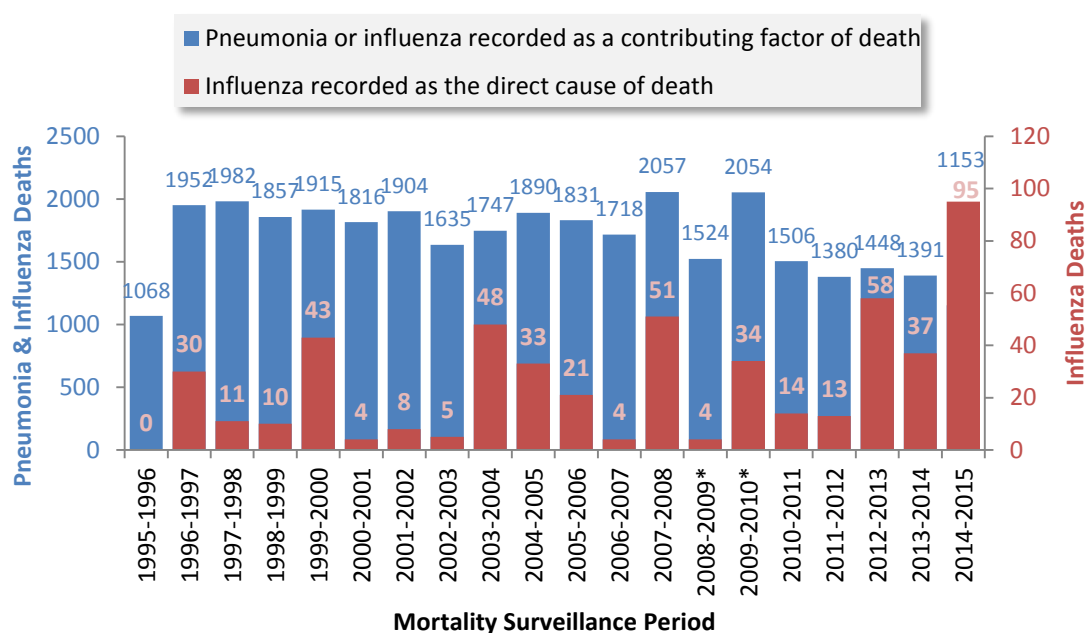
Figure 6: Deaths attributed to pneumonia or influenza by month, Kansas, September 2012-May 2015*



* 2014-2015 data is provisional and subject to change.

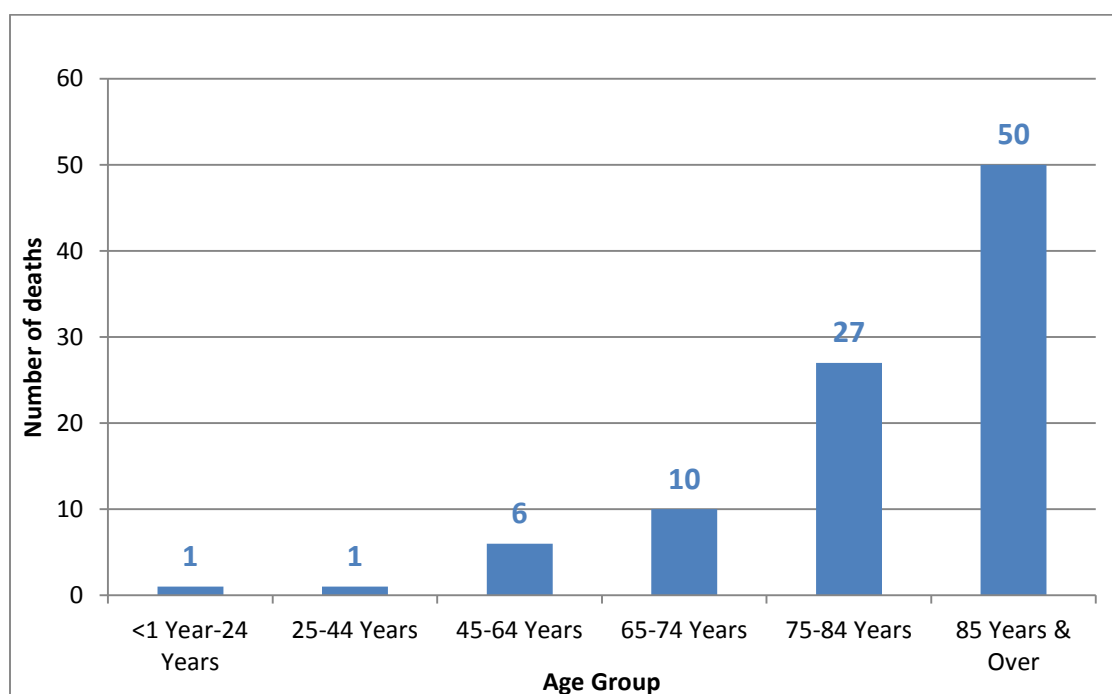
A total of 1,153 pneumonia and influenza deaths occurred during the 2014-2015 surveillance period. The observed mortality was below the 20-year median of 1,781 (Figure 7). During the 2014-2015 surveillance period, 95 deaths (8%) were directly attributed to influenza—this number was well above the 20-year median (18 deaths) observed since the 1995-1996 surveillance period, and above the 20-year mean (26 deaths). The majority of these deaths occurred in individuals aged 85 years or older with 50 deaths (53%) (Figure 8).

Figure 7: Pneumonia and influenza mortality by surveillance period, Kansas, 1995-2015 *



**Each influenza season begins September 1 and ends May 31 of the following year, with the exception of 2008-2009 (September 1, 2008 through April 30, 2009) and 2009-2010 (May 1, 2009 through May 31, 2010). This time shift is due to the emergence of pandemic H1N1 in May 2009. The 2014-2015 data is provisional and subject to change.*

Figure 8: Influenza recorded as direct cause of death by age group, Kansas, September 2014 – May 2015



INFLUENZA-ASSOCIATED PEDIATRIC MORTALITY

Since 2004, CDC has requested information on influenza-associated pediatric deaths; the condition was added to the list of reportable diseases in Kansas in 2006. For surveillance purposes, pediatric deaths were considered influenza-related if there was no period of complete recovery between the clinically compatible illness and death, and if the diagnosis was confirmed to be influenza by an appropriate laboratory or rapid diagnostic test.

During the 2014-2015 surveillance period, two confirmed influenza-associated pediatric deaths were reported in Kansas.

SUMMARY

Typically, ILI in Kansas has peaked in December, January, or February. The ILI rate peaked in Kansas at 8.8% during the week ending January 2, 2015. The peak rate was higher than what was observed during the previous two surveillance periods; ILI peaked at 6.0% during 2013-14, and 6.1% during 2011-12. Two influenza viruses were detected in Kansas: A/H3, and B. The predominant strain in Kansas and the U.S. was A/H3.

Influenza vaccination during the 2014-15 season offered reduced protections against the predominant circulating A/H3 virus, compared with previous seasons when most circulating and vaccine strain viruses were well-matched. This may have contributed to the higher peak of ILI seen in Kansas during 2014-15.

During the 2014-15 influenza season, 95 deaths were directly attributed to influenza. This was the highest number of influenza deaths in the last 20 years in Kansas. This reflected the national trend—the CDC determined that P&I mortality during 2014-15 was comparable to previous severe flu seasons. Of the Kansas deaths, 53% were among those 85 years and older.



BACKGROUND

Arboviruses (arthropod-borne virus) are commonly spread to humans through the bites of infected mosquitoes, ticks, sand flies, or midges. This report focuses on those arboviruses transmitted by mosquitoes. West Nile virus is the leading cause of domestically acquired arboviral disease in the United States and Kansas¹. West Nile virus was first identified in the United States in 1999 and spread throughout the United States. Natural transmission involves a mosquito-bird-mosquito cycle; animals such as humans and horses do not circulate enough virus to re-infect a blood-feeding mosquito, and thus are referred to as "dead-end" or "accidental" hosts. Several species of mosquitoes are responsible for transmission of arboviruses but *Culex* species are the primary vector for West Nile virus in the United States.

The incubation period for arboviral infections vary. The incubation period for West Nile virus ranges from 3 to 15 days with an average incubation period of approximately one week. Arboviral infections may be asymptomatic or may result in illness of variable severity. Approximately 80% of people who become infected with West Nile virus do not develop any symptoms¹. About one in five people who are infected develop a fever with other symptoms such as headache, body aches, joint pains, vomiting, diarrhea, or rash¹. Most people with West Nile virus Fever recover completely but fatigue and weakness can last for weeks or months¹. Less than 1% of people who are infected develop a serious neurological illness, such as encephalitis or meningitis, and approximately 10% of people who develop this kind of an infection will die¹.

From 1999 – 2014 there were a total of 41,762 cases and 1,765 deaths in the United States from West Nile virus². During 2012 the United States experienced an outbreak of West Nile virus that resulted in the second highest number of cases since 2002, with 5,674 cases reported to the Centers for Disease Control and Prevention (CDC)². The number of cases declined sharply in 2013 with a 56.5% reduction in cases reported to CDC². However, Kansas had a 63% increase in human cases in 2013. Cases continued to decline nationally in 2014 with an 11% reduction from 2013. Kansas had a substantial reduction in West Nile virus cases, 41%, from 2013 to 2014.

The Kansas Department of Health and Environment (KDHE) began surveillance for West Nile virus (WNV) in 2001 and the first human case was reported in Kansas in 2002. Mosquito surveillance was consolidated to Sedgwick County in 2013. This surveillance system has three main components: mosquito surveillance, human surveillance, and reporting the results to public health partners.

METHODS

MOSQUITO COLLECTION

Mosquito surveillance was conducted weekly from May 13 to October 21, 2014 by Dr. Christopher Rogers with the Kansas Biological Survey. Surveillance was conducted in Sedgwick County, where human cases have been reported most frequently in Kansas. Mosquito surveillance has been conducted solely in Sedgwick County since 2013. The traps were placed where mosquito arbovirus transmission was most likely to occur. These areas are where large numbers of migratory birds, extensive mosquito habitats, and large human populations coincide.

An Encephalitis Vector Survey (EVS) trap, with dry ice as a carbon dioxide source, was used to collect mosquitoes. These traps typically attract mosquitoes that feed on humans or other mammals. Nine traps were set each week in Sedgwick County. The traps were placed at the designated location in the early evening and were collected the following morning. The contents of the traps were secured in a container and labeled with the address and GPS coordinates of the location of the trap. The mosquitoes were transported to the Kansas Biological Survey (KBS) at the University of Kansas for species identification.

MOSQUITO IDENTIFICATION

The KDHE contracted with the Kansas Biological Survey (KBS) to enumerate and identify mosquitoes to the species level. Mosquito counts of greater than 1,000 per trap were divided into a smaller subset for identification due to budget constraints. *Culex spp.*, the most common mosquito to transmit WNV, were submitted to the Kansas Health and Environmental Laboratories (KHEL) for testing. Results from the enumeration and identification were entered in a Microsoft® Excel® spreadsheet and submitted by KBS to KDHE weekly via e-mail.

WEST NILE VIRUS TESTING OF MOSQUITOES

Mosquitoes of the genus *Culex*, the most common West Nile virus vector, were tested at the Kansas Health and Environmental Laboratories. Mosquitoes were divided into vials containing approximately 50 mosquitoes each and tested for West Nile virus by polymerase chain reaction (PCR). The results were entered in an Excel® spreadsheet and sent to KDHE. All results were posted to [KDHE's website](#) and reported to the ArboNET surveillance system. (ArboNET is a national arboviral surveillance system managed by the Centers for the Disease Control and Prevention (CDC) and state health departments.)

HUMAN CASE SURVEILLANCE

West Nile virus, and all other arboviral diseases, is a reportable disease in Kansas. It is a passive surveillance system; healthcare providers or laboratories are required to report cases to KDHE. Cases were classified according to the most recent CDC case definition (Appendix A). Confirmed and probable cases are reported to CDC and are included as the case count (e.g. confirmed + probable = total number of cases). It is important to note that these definitions are to be used for case counts only and are not used for clinical diagnosis. In addition, the county in which the person resides is used as the location for surveillance purposes, although they may have been infected elsewhere. Prior to 2011 Kansas only reported confirmed cases therefore we are only able to compare case counts and rates of West Nile virus from 2011-2014.

The cases were entered into EpiTrax, Kansas' electronic disease surveillance system, and the corresponding local health department completed investigation. The [Arboviral Disease Investigation Guideline](#) contains information to provide technical assistance with local surveillance and disease investigation. They contain not only disease-specific information, but also sample letters, reporting forms, sample communication sheets and other tools to assist the local public health department. Once the case investigation was complete, all confirmed and probable cases were reported to the ArboNET surveillance system and the results were posted to

the [ArboNET website](#). Information on human West Nile virus case counts and rates can be found in KDHE's annual publication, [Reportable Infectious Diseases in Kansas](#).

We report the incidence rate (number of cases per 100,000 people) of West Nile virus neuroinvasive disease cases for Sedgwick County and compare it to the State of Kansas, the West North Central region (Iowa, Kansas Minnesota, Missouri, Nebraska, North Dakota, and South Dakota), and the United States. We limit our incidence rates to neuroinvasive disease cases as reporting for these cases are believed to be more consistent and complete than for non-neuroinvasive disease cases³.

ANIMAL CASE SURVEILLANCE

West Nile virus infection of animals is not a reportable disease in Kansas. However, positive laboratory results are sent to KDHE as a courtesy from the Kansas Department of Agriculture's Division of Animal Health and the United States Department of Agriculture's Animal and Plant Health Inspection Service. Horses may serve as a sentinel of West Nile virus activity in Kansas. Kansas does not conduct surveillance of dead birds for West Nile virus.

MOSQUITO CONTROL

The Sedgwick County Health Department, City of Wichita, Sedgwick County Extension Office, and McConnell Air Force Base worked together in an effort to educate citizens, control mosquitoes, and decrease the risk of West Nile virus transmission in Sedgwick County. The Sedgwick County Health Department developed 'Fight the Bite' educational materials that highlighted the three 'D's of prevention; drain, dress, and DEET (Appendix B). Code Enforcement Officers with the Metropolitan Area Building and Construction Department (MABCD), distributed the 'Fight the Bite' palm cards to citizens as they conducted inspections throughout the city of Wichita and Sedgwick County. The Sedgwick County Extension Master Gardeners, Extension Agents, and the 22nd Medical Group Public Health staff at McConnell Air Force Base also distributed the palm cards. The following list contains examples of the public locations where the posters were displayed; neighborhood City Halls, libraries, swimming pools, recreation centers, golf courses, and city park restrooms.

The City of Wichita deployed mosquito larvicide 'dunks' to areas of standing water that were likely breeding locations for mosquitoes based on surveillance data. The 'dunks' were deployed in these areas when the *Culex spp.* mosquitoes were ≥ 20 per trap. The larvicide contained in the dunks is a type of bacteria, *Bacillus thuringiensis israelensis*, or Bti. When the Bti is eaten by mosquito larvae it prevents their development into adult mosquitoes. It is non-toxic to other insects, fish, animals, and humans. One dunk treats approximately 100 square feet of water and lasts up to 30 days.

MEASURES TO PREDICT WEST NILE VIRUS CASES

The evaluation of the 2013 mosquito surveillance data indicated a strong correlation between the two-week mean *Culex spp.* prevalence and human cases that occurred in Sedgwick County and throughout the entire state of Kansas, three weeks later⁴. When the two-week mean number of *Culex* mosquitoes per trap was ≥ 44 , 82% (9/11) of human WNV cases occurred three weeks later

in Sedgwick County and 89% (81/91) of cases occurred three weeks later throughout the state of Kansas.⁴

We calculated the two-week mean *Culex spp.* prevalence and compared it to the number of human cases that occurred throughout the entire state for 2014. The two-week mean is calculated by counting the number female *Culex spp.* per trap for the current week of surveillance and the previous week and dividing by the number of traps during the same two weeks. There was only one case of West Nile virus in Sedgwick County during 2014 therefore we did not compare the two-week mean *Culex spp.* prevalence. In addition we combined data from 2013 and 2014 to increase sample size and to evaluate trends over time. The mean number of *Culex spp.* by two-week prevalence was compared to human cases that occurred at weekly intervals 2, 3, and 4 weeks later. The correlation between measures was calculated using Pearson's correlation coefficient (R) and a p-value of <0.05 was considered statistically significant.

The Vector Index (VI) can be used to quantify potential risk of transmission of West Nile virus from mosquitoes to humans⁵. The VI requires three values to complete the calculation; female vector mosquito presence, vector species density, and vector species infection rate⁵. There was only one WNV positive mosquito pool in 2014 therefore we did not calculate the VI.

RESULTS

MOSQUITO SURVEILLANCE

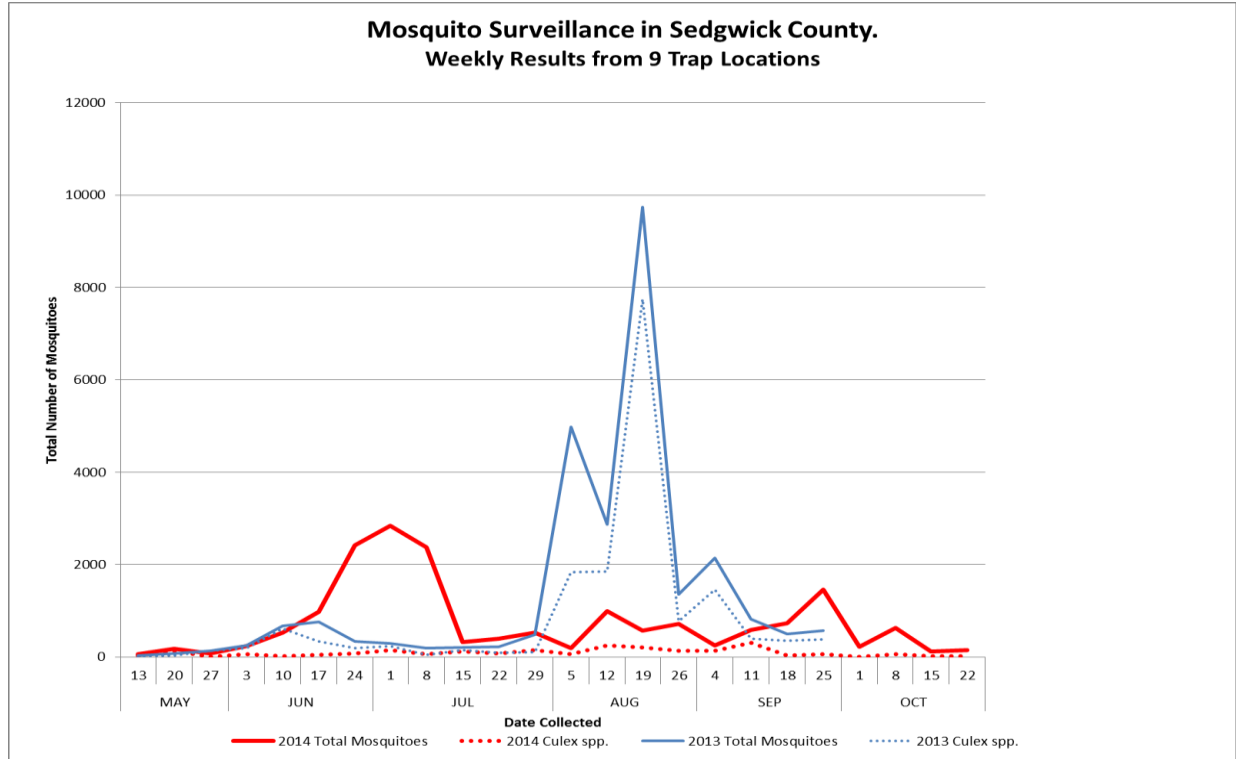
Mosquito Identification

Mosquito collection began on May 13 and continued weekly through October 21, 2014. All identified species (Table 1) have been previously documented in Kansas.

Mosquito Abundance

A trap night is calculated by taking the number of traps per week and multiplying it by the number of weeks of surveillance. There were nine trap nights per week during the twenty-four weeks of surveillance for a total of 216 trap nights. The median number of mosquitoes collected each week was 542 (range 56 – 2842) and the median number of *Culex spp.* mosquitoes was 100 (range 0 – 7744) (Figure 1). The mean number of *Culex spp.* per trap (number of mosquitoes divided by the number of traps per week) ranged from 3 – 860.

Figure 1. Mean number of mosquitoes collected per week, Sedgwick County, 2014



There were 17,162 mosquitoes collected during 24 weeks of surveillance. The mosquito *Aedes vexans* (68%), a pest mosquito that does not transmit disease, comprised the majority of mosquitoes collected (Table 1). *Culex tarsalis* (8%) and *Culex pipiens/quinqüefasciatus* (3%), both vectors for WNV, were collected at significantly lower numbers than *Aedes vexans* and accounted for a much smaller proportion of the type of mosquitoes collected compared to 2013 (Table 2).

Table 1. Mosquito species collected, Sedgwick County, 2014.

Mosquito Species	Number	% Total
<i>Aedes vexans</i>	11728	68
<i>Culex tarsalis</i>	1425	8
<i>Anopheles quadrimaculatus</i>	892	5
<i>Aedes albopictus</i>	774	5
<i>Psorophora cyanescens</i>	461	3
<i>Culex pipiens/quinqüefasciatus</i>	448	3
<i>Psorophora columbiae</i>	381	2
<i>Psorophora discolor</i>	271	2
<i>Culiseta inornata</i>	221	1
<i>Culex erraticus</i>	153	1
<i>Culex restuans</i>	141	1
<i>Ochlerotatus triseriatus</i>	109	1
<i>Ochlerotatus trivittatus</i>	102	1
<i>Anopheles punctipennis</i>	25	<0.1
<i>Psorophora ciliata</i>	12	0.1
<i>Ochlerotatus nigromaculis</i>	5	<0.1
<i>Orthopodomyia signifera</i>	4	<0.1
<i>Uranotaenia sapphirina</i>	4	<0.1
<i>Psorophora horrida</i>	3	<0.1
<i>Ochlerotatus zoophilus</i>	1	<0.1
<i>Ochlerotatus epactius</i>	1	<0.1
<i>Anopheles barberi</i>	1	<0.1
Total	17162	

Table 2. Mosquito species collected by year, Sedgwick County.

Mosquito Species	2013		2014	
	<i>Number</i>	<i>% Total</i>	<i>Number</i>	<i>% Total</i>
<i>Aedes vexans</i>	6683	25	11728	68
<i>Culex tarsalis</i>	9458	35	1425	8
<i>Culex pipiens/quinqüefasciatus</i>	6683	27	892	5

Arboviral Testing

Mosquitoes were pooled for testing with up to 50 mosquitoes included per vial. Mosquitoes collected on July 22 were not tested for WNV as the specimens were not suitable for testing. A total of 143 vials were tested for West Nile virus; only 1 vial tested positive (0.7%) for West Nile virus (Figure 2). The mosquitoes in the only WNV positive vial were collected on August 19. This was a substantial decrease from 2013 where 10.5% of vials were positive for WNV.

HUMAN CASE SURVEILLANCE

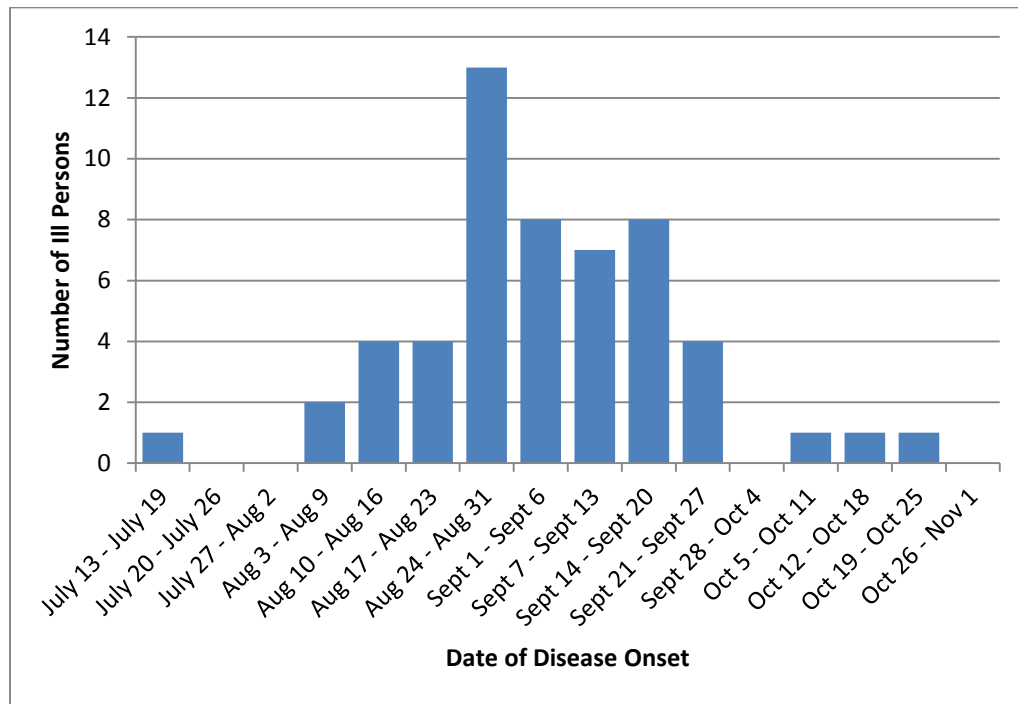
State of Kansas

A total of 54 human cases of West Nile virus were reported in the state of Kansas during 2014 (Table 3). This was a 41% decrease in cases from 2013 (n= 92). There were 36 cases of non-neuroinvasive WNV and 18 cases of neuroinvasive WNV. There was one case of non-neuroinvasive WNV and no cases of neuroinvasive WNV in Sedgwick County during 2014. The median age of case-patients was 54 years (range 10 – 78 years). Twenty-seven cases (52%) were hospitalized. No deaths were reported. The earliest case became ill in July; the majority (50%) of cases had disease onset during September (Figure 2).

Table 3. Human West Nile virus case characteristics, Kansas, 2013-2014.

	<u>2013</u>	<u>2014</u>
Number of Cases	92	54
Age (years)		
Median	59.5	54
Range	12-85	10-78
	Number of Cases (%)	
Gender		
Male	63 (68)	32 (61)
Female	29 (32)	20 (39)
Month of Disease Onset		
July	3 (3)	1 (2)
August	13 (14)	23 (43)
September	67 (73)	27 (50)
October	9 (10)	3 (6)
Clinical Status		
Neuroinvasive disease	33 (36)	18 (33)
Non-neuroinvasive disease	59 (64)	38 (70)
Hospitalized	56 (61)	27 (52)
Died	8 (9)	0

Figure 2. Number of Human West Nile virus Cases by Week of Disease Onset, Kansas, 2014.



West Nile virus Neuroinvasive Disease

The neuroinvasive case rate decreased 53% in the State of Kansas and 64% in the West North Central region (Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, and South Dakota) from 2013 to 2014. There were no cases of neuroinvasive West Nile virus disease in Sedgwick County in 2014 compared to 4 cases in 2013 (Table 4).

Table 4. West Nile virus neuroinvasive disease count and incidence rate* by year, 2011-2014

Region	2011		2012		2013		2014	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Sedgwick County	0	N/A	10	1.98	4	0.79	0	N/A
Kansas	4	0.14	20	0.69	34	1.17	18	0.62
West North Central	31	0.15	225	1.08	288	1.38	104	0.50
U.S.	486	0.16	2,873	0.92	1,267	0.40	1,347	0.42

*Number of cases per 100,000 population, based on July 1, 2013 U.S. Census population estimates.

†U.S. Census region, West North Central includes; Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, and South Dakota.

ANIMAL SURVEILLANCE

Animal Case Surveillance

There was one bird that tested positive for WNV in Sedgwick County during 2014. No other WNV positive animals were reported.

MOSQUITO CONTROL

The City of Wichita deployed 600 larvicide dunks within areas of standing water that were identified as likely mosquito breeding locations based on adult mosquito surveillance. No adulticiding, or spraying for adult mosquitoes, was performed.

‘Fight the Bite’ educational campaign materials were developed and distributed in a variety of formats, including posters and palm cards. There were a total of 1,625 palm cards and 242 posters distributed within Sedgwick County during 2014. This is a 30% increase from the number of ‘Fight the Bite’ educational materials distributed during 2013⁴.

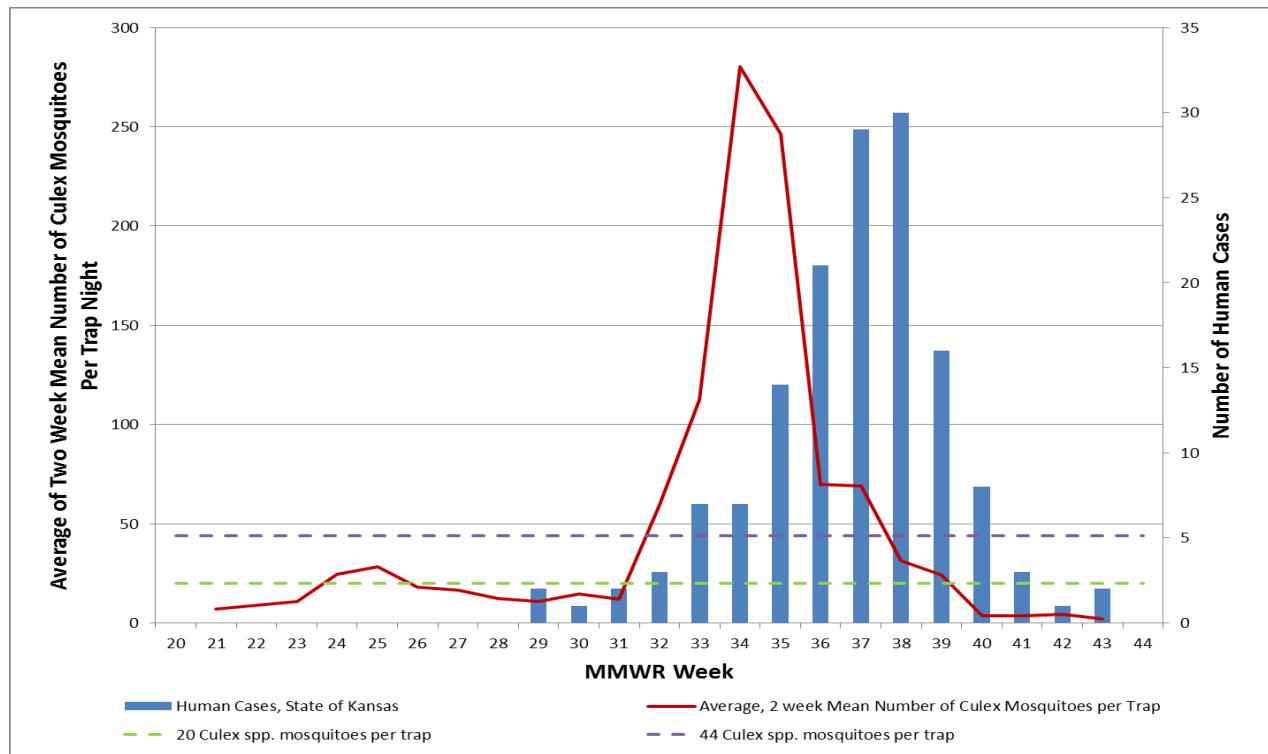
EVALUATION OF MEASURES TO PREDICT WEST NILE VIRUS CASES

The two-week mean number of *Culex* mosquitoes was calculated and compared with the number of human cases for the entire state of Kansas that occurred in 2014, two, three, and four weeks later. There was a strong correlation between the two-week mean *Culex* prevalence and human cases that occurred in Kansas two weeks ($R=0.73$) later. However there was a weak correlation when we compared the two-week mean *Culex* prevalence to cases that occurred three weeks ($R = 0.56$) and four weeks ($R = 0.48$) later.

The 2013 and 2014 data was combined and the two-week mean number of *Culex* mosquitoes was compared with the number of human cases in Sedgwick County and the state of Kansas. There was a strong correlation between the two-week mean *Culex* prevalence and human cases that occurred in Sedgwick County two weeks ($R = 0.82$) and three weeks ($R = 0.64$) later. In addition there was a strong correlation between the two-week mean *Culex* prevalence and human cases throughout the entire state two weeks ($R = 0.62$), three weeks ($R = 0.85$), and four weeks ($R = 0.74$) later.

We evaluated the moving two-week *Culex* mosquito prevalence estimate to determine if there was a number at which the mean number of *Culex* mosquitoes could be used to guide mitigation actions. Seventy-five percent (9/12) cases occurred 2 weeks after the 2-week mean number of *Culex* mosquitoes was ≥ 44 per trap. Fifty-six percent (81/145) of cases occurred two weeks later throughout the state of Kansas when the two-week mean number of *Culex* mosquitoes per trap was ≥ 44 (Figure 5). However 81% (117/145) of cases occurred 2 weeks after the 2 week mean *Culex* mosquitoes was ≥ 20 per trap (Figure 5).

Figure 5. Two-Week Mean *Culex* Mosquito Prevalence and Human Cases Two Weeks Later, Kansas, 2013-2014.



DISCUSSION

We changed our mosquito surveillance methodology in 2013 to concentrate all of our mosquito traps in the county where the highest number of human cases had been reported each year (Sedgwick County). This allowed us to increase the number of surveillance sites in a highly populated area, increase the amount of data collected, and quantify an action level at which mosquito control efforts should occur for public health officials.

There have been several peer-reviewed papers that have evaluated the utility of mosquito surveillance data to attempt to quantify a measure or measures that can be used to predict human West Nile virus transmission from mosquitoes to humans⁶⁻⁸. Although the Vector Index is considered the gold-standard it relies on the results from West Nile virus (or other arboviruses) positive mosquitoes which can cause, at a minimum, a one to two week delay⁷. Our evaluation of the Vector Index in 2013 revealed no correlation between the VI and human cases. It does not appear that the VI is a useful measure to predict human cases of WNV in Kansas. We may re-evaluate the use of the VI when subsequent years of data are available however until then we will no longer calculate the VI.

In 2013 we discovered a strong correlation ($R=0.82$) between the two-week mean *Culex* prevalence and human cases occurring in Sedgwick County three weeks later. There was also a strong correlation between the two-week mean *Culex* prevalence and human cases occurring throughout the entire state of Kansas three ($R=0.65$) and four weeks ($R=0.95$) later⁴. This

measure increased timeliness of the WNV surveillance data as the mosquito enumeration and identification results are usually available within 3 business days of collection. Our findings are consistent with the results of other published studies. Bolling et al concluded that abundance of *Culex tarsalis* females were strongly associated with weekly numbers of West Nile virus disease cases with onset 4-7 weeks later⁷. Drs. Kilpatrick and Pape state that use of a two- or three-week moving window of vector index would alleviate substantial week-to-week variation of the risk index⁶.

The majority of cases occurred in Sedgwick County, and the entire state, two weeks after the two-week mean *Culex* prevalence was ≥ 44 *Culex* mosquitoes per trap night. This information can guide Sedgwick County and the City of Wichita officials on the location(s) to concentrate mosquito mitigation efforts and to focus public health messaging to residents of Sedgwick County. In addition, this information can also be used to alert all people in the state of Kansas when the risk of West Nile virus transmission may be increased.

There were at least three limitations of our study. First, we do not know the exact location where the cases were infected. For the purpose of this study we assume that the case was infected in their county of residence. This may under or overestimate the number of cases in Sedgwick County. Second, we were only able to evaluate two years of data as the sampling methodology changed between 2012 and 2013. Finally there was substantial variation in the proportion of *Culex spp.* mosquitoes between 2013 and 2014. Additional years of data are needed to understand variations in mosquito surveillance composition and the effects of transmission of West Nile virus among humans in Sedgwick County.

West Nile virus has been endemic in Kansas since 2003 with annual cases declining until the nationwide outbreak in 2012. From 2012-2013, the number of neuroinvasive West Nile virus cases decreased 83% in the United States; however, Kansas had a 70% *increase* in cases. While Sedgwick County has reported the highest number of cases of neuroinvasive disease in the state, there was a substantial (60%) *decrease* of the number of cases reported from 2012-2013. From 2013-2014, neuroinvasive WNV cases decreased to zero in Sedgwick County. Although neuroinvasive WNV cases decreased in Kansas in the same time frame, the rate was still higher than pre-outbreak rate (Table 4). We believe that the decrease in Sedgwick County is due, in part, to the targeted larvicidal treatment of mosquito breeding sites identified through adult mosquito surveillance efforts and educational outreach. Further evaluation is needed to quantify these interventions.

Outbreaks of arboviruses, such as West Nile virus, are difficult to predict due to the variety of factors that can influence transmission of this disease including weather (e.g. precipitation and temperature, animal and human host abundance, and human behaviors (e.g. use of repellent, outdoor activity, etc.)⁷.

People should take the following precautions to protect against West Nile virus:

- When you are outdoors, use insect repellent containing an [EPA-registered active ingredient](#) on skin and clothing, including DEET, picaridin, oil of lemon eucalyptus, or IR3535. Follow the directions on the package.
- Many mosquitoes are most active at dusk and dawn. Be sure to use insect repellent and wear long sleeves and pants at these times or consider staying indoors during these hours.

- Make sure you have good screens on your windows and doors to keep mosquitoes out.
- Get rid of mosquito breeding sites by emptying standing water from flower pots, buckets and barrels. Change the water in pet dishes and replace the water in bird baths weekly. Drill holes in tire swings so water drains out. Keep children's wading pools empty and on their sides when they aren't being used.

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APPENDIX A: WEST NILE VIRUS SURVEILLANCE CASE DEFINITION, 2014

CLINICAL CRITERIA FOR SURVEILLANCE PURPOSES

Neuroinvasive disease

- Fever ($\geq 100.4^{\circ}\text{F}$ or 38°C) as reported by the patient or a health-care provider, **AND**
- Meningitis, encephalitis, acute flaccid paralysis, or other acute signs of central or peripheral neurologic dysfunction, as documented by a physician, **AND**
- Absence of a more likely clinical explanation.

Non-neuroinvasive disease

- Fever ($\geq 100.4^{\circ}\text{F}$ or 38°C) as reported by the patient or a health-care provider, **AND**
- Absence of neuroinvasive disease, **AND**
- Absence of a more likely clinical explanation.

LABORATORY CRITERIA FOR SURVEILLANCE PURPOSES

- Isolation of virus from, or demonstration of specific viral antigen or nucleic acid in, tissue, blood, CSF, or other body fluid, **OR**
- Four-fold or greater change in virus-specific quantitative antibody titers in paired sera, **OR**
- Virus-specific IgM antibodies in serum with confirmatory virus-specific neutralizing antibodies in the same or a later specimen, **OR**
- Virus-specific IgM antibodies in CSF and a negative result for other IgM antibodies in CSF for arboviruses endemic to the region where exposure occurred, **OR**
- Virus-specific IgM antibodies in CSF or serum.

SURVEILLANCE CASE DEFINITIONS

- *Confirmed:*

Neuroinvasive disease

A case that meets the above clinical criteria for neuroinvasive disease and one or more the following laboratory criteria for a confirmed case:

- Isolation of virus from, or demonstration of specific viral antigen or nucleic acid in, tissue, blood, CSF, or other body fluid, **OR**
- Four-fold or greater change in virus-specific quantitative antibody titers in paired sera, **OR**
- Virus-specific IgM antibodies in serum with confirmatory virus-specific neutralizing antibodies in the same or a later specimen, **OR**
- Virus-specific IgM antibodies in CSF and a negative result for other IgM antibodies in CSF for arboviruses endemic to the region where exposure occurred.

Non-neuroinvasive disease

A case that meets the above clinical criteria for non-neuroinvasive disease and one or more of the following laboratory criteria for a confirmed case:

- Isolation of virus from, or demonstration of specific viral antigen or nucleic acid in, tissue, blood, CSF, or other body fluid, **OR**
- Four-fold or greater change in virus-specific quantitative antibody titers in paired sera, **OR**
- Virus-specific IgM antibodies in serum with confirmatory virus-specific neutralizing antibodies in the same or a later specimen, **OR**
- Virus-specific IgM antibodies in CSF and a negative result for other IgM antibodies in CSF for arboviruses endemic to the region where exposure occurred.

➤ *Probable:*

Neuroinvasive disease

A case that meets the above clinical criteria for neuroinvasive disease and the following laboratory criteria:

- Virus-specific IgM antibodies in CSF or serum but with no other testing.

Non-neuroinvasive disease

A case that meets the above clinical criteria for non-neuroinvasive disease and the laboratory criteria for a probable case:

- Virus-specific IgM antibodies in CSF or serum but with no other testing.

**APPENDIX B: SEDGWICK COUNTY HEALTH DEPARTMENT, 'FIGHT THE BITE'
PALM CARD**

Fight the BITE!

Mosquitoes are annoying.
They can also **cause serious health problems.**
These tiny insects spread diseases like **West Nile Virus** to humans and heartworms to our pets.

The best way to avoid bites
from these little **suckers** is to follow the three Ds:

DRAIN



Eliminate standing water; mosquitoes need water to breed. Check pots, gutters, tires, tarps, wagons, wheelbarrows – anything that holds water. Change any standing water in wading pools, pet dishes and bird baths several times a week. And, use mosquito dunks or mosquito-eating fish in ponds and stagnant water.

DEET



Use insect repellents that contain DEET. DEET offers the best protection against mosquito bites. Follow product label directions. Avoid over-application.

DRESS



Wear long, loose-fitting clothing when outdoors, especially at dawn and dusk hours, which is when mosquitoes are most active.

West Nile Virus Facts

Spread


- West Nile virus infection is spread to humans and mammals such as horses by the bite of an infected mosquito.
- Mosquitoes are infected when they feed on the blood of infected birds.
- WNV cannot be spread person-to-person or mammal-to-person.

Symptoms

- About 1 in 150 people infected with WNV develop severe illness that may require hospitalization, and about 30 will have a more mild illness.
- Mild symptoms can include fever, headache, body aches, nausea, vomiting, swollen lymph glands and skin rash.
- More severe symptoms include neck stiffness, disorientation, tremors, convulsions, muscle weakness, vision loss, numbness, paralysis and even coma or death.
- If you develop severe symptoms, seek medical attention immediately.
- Pregnant women and nursing mothers are encouraged to talk to their doctors if they develop symptoms.

For more information about **West Nile Virus** and mosquito bite prevention, contact the

Sedgwick County Health Department
at 316-660-7300
or visit www.sedgwickcounty.org.



Sedgwick County...
working for you

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Our Mission

To protect and improve the health and environment of all Kansans